COLLECTED ESSAYS

By T. H. HUXLEY

VOLUME IV

THOMAS H. HUXLEY'S WORKS.

Collected Essays.

Vol. 1. Method and Results.
" 2. Darwiniana.
" 3. Science and Education.
" 4. Science and Hebrew Tradition.
" 5. Science and Christian Tradition.
" 6. Hume.
" 7. Ethical and Philosophical Essays.
" 8. Man's Place in Nature.
" 9. Essays in Science.
12mo. Cloth, $1.25 per vol.

The Crayfish:
An Introduction to the Study of Zoology. With 82 Illustrations. 12mo. Cloth, $1.75.

Manual of the Anatomy of Vertebrated Animals. Illustrated. 12mo. Cloth, $2.50.

Manual of the Anatomy of Invertebrated Animals. Illustrated. 12mo. Cloth, $2.50.

Physiography:
An Introduction to the Study of Nature. With Illustrations and Colored Plates. 12mo. Cloth, $2.50.

New York: D. APPLETON & Co., 1, 3, & 5 Bond Street.

SCIENCE AND HEBREW TRADITION

ESSAYS

BY
THOMAS H. HUXLEY

NEW YORK
D. APPLETON AND COMPANY
1894

Authorized Edition.

PREFACE

For more than a thousand years, the great majority of the most highly civilised and instructed nations in the world have confidently believed and passionately maintained that certain writings, which they entitle sacred, occupy a unique position in literature, in that they possess an authority, different in kind, and immeasurably superior in weight, to that of all other books. Age after age, they have held it to be an indisputable truth that, whoever may be the ostensible writers of the Jewish, Christian, and Mahometan scriptures, God Himself is their real author; and, since their conception of the attributes of the Deity excludes the possibility of error and —at least in relation to this particular matter—of wilful deception, they have drawn the logical conclusion that the denier of the accuracy of any statement, the questioner of the binding force of any command, to be found in these documents is not merely a fool, but a blasphemer. From the point of view of mere reason he grossly blunders; from that of religion he grievously sins.

But, if this dogma of Rabbinical invention is well founded; if, for example, every word in our Bible has been dictated by the Deity;[1] or even, if it be held to be the Divine purpose that every proposition should be understood by the hearer or reader in the plain sense of the words employed (and it seems impossible to reconcile the Divine attribute of truthfulness with any other intention), a serious strain upon faith must arise. Moreover, experience has proved that the severity of this strain tends to increase, and in an even more rapid ratio, with the growth in intelligence of mankind and with the enlargement of the sphere of assured knowledge among them.

It is becoming, if it has not become, impossible for men of clear intellect and adequate instruction to believe, and it has ceased, or is ceasing, to be possible for such men honestly to say they believe, that the universe came into being in the fashion described in the first chapter of Genesis; or to accept, as a literal truth, the story of the making of woman, with the account of the catastrophe which followed hard upon it, in the second chapter; or to admit that the earth was repeopled with terrestrial inhabitants by migration from

[1] "Whoso says that Moses wrote even a single verse [of the Pentateuch] from his own knowledge, denies and contemns the Word of God," *bab Sanhedrin* 99a, cited by Schürer, *Geschichte des Jüdischen Volkes*, Bd. II. p. 249. The account of the death of Moses in the last eight verses of Deuteronomy was, of course, dictated to and written by himself, like all the rest. Admit prophetic inspiration and what becomes of the difficulty? Surely, a quite unanswerable argument.

Armenia or Kurdistan, little more than 4,000 years ago, which is implied in the eighth chapter; or finally, to shape their conduct in accordance with the conviction that the world is haunted by innumerable demons, who take possession of men and may be driven out of them by exorcistic adjurations, which pervades the Gospels.

Nevertheless, if there is any justification for the dogma of plenary inspiration, the damnatory prodigality of even the Athanasian Creed is still too sparing. "Whosoever will be saved" must believe, not only all these things, but a great many others of equal repugnancy to common sense and everyday knowledge.

The doctrine of biblical infallibility, which involves these remarkable consequences, was widely held by my countrymen within my recollection: I have reason to think that many persons of unimpeachable piety, a few of learning, and even some of intelligence, yet uphold it. But I venture to entertain a doubt whether it can produce any champion whose competency and authority would be recognised beyond the limits of the sect, or theological coterie, to which he belongs. On the contrary, apologetic effort, at present, appears to devote itself to the end of keeping the name of "Inspiration" to suggest the divine source, and consequent infallibility, of more or less of the biblical literature, while carefully emptying the term of any definite sense. For "plenary inspiration" we are asked to substitute

a sort of "inspiration with limited liability," the limit being susceptible of indefinite fluctuation in correspondence with the demands of scientific criticism. Where this advances that at once retreats.

This Parthian policy is carried out with some dexterity; but, like other such manœuvres in the face of a strong foe, it seems likely to end in disaster. It is easy to say, and sounds plausible, that the Bible was not meant to teach anything but ethics and religion, and that its utterances on other matters are mere *obiter dicta;* it is also a specious suggestion that inspiration, filtering through human brains, must undergo a kind of fallibility contamination; and that this human impurity is responsible for any errors, the existence of which has to be admitted, however unwillingly.

But how does the apologist know what the biblical writers intended to teach, and what they did not intend to teach? And even if their authority is restricted to matters of faith and morals, who is prepared to deny that the story of the fabrication of Eve, that of the lapse from innocence effected by a talking snake, that of the Deluge and the demonological legends, have exercised, and still exercise, a profound influence on Christian theology and Christian ethics? The very apologists who put forth this plea are never weary of declaring that the Divine authority for the moral law is the only safe foundation of ethics. But if

several of the most important Pentateuchal narratives prove to be utterly unworthy of credit, what pretence is there for accepting other uncorroborated stories of a no less improbable character? If the writers of the gospels have taken fiction for truth, the survivals of pagan superstition for religion, in one department of spiritual knowledge, what guarantee have we for their infallibility in other departments? If the "human element" must be admitted to have already encroached so largely beyond the bounds, erstwhile thought to be set by Divine authority, what justification is there for imagining that any limit can be set to the discovery of further invasions?

The truth is that the pretension to infallibility, by whomsoever made, has done endless mischief; with impartial malignity it has proved a curse, alike to those who have made it and those who have accepted it; and its most baneful shape is book infallibility. For sacerdotal corporations and schools of philosophy are able, under due compulsion of opinion, to retreat from positions that have become untenable; while the dead hand of a book sets and stiffens, amidst texts and formulæ, until it becomes a mere petrifaction, fit only for that function of stumbling block, which it so admirably performs. Wherever bibliolatry has prevailed, bigotry and cruelty have accompanied it. It lies at the root of the deep-seated, sometimes disguised, but never absent, antagonism of all the varieties of ecclesiasticism to the freedom of thought and to the

spirit of scientific investigation. For those who look upon ignorance as one of the chief sources of evil; and hold veracity, not merely in act, but in thought, to be the one condition of true progress, whether moral or intellectual, it is clear that the biblical idol must go the way of all other idols. Of infallibility, in all shapes, lay or clerical, it is needful to iterate with more than Catonic pertinacity, *Delenda est.*

The essays contained in the present and the following volume are, for the most part, intended to contribute, in however slight a degree, to this process of deletion. Unless I greatly err, the arguments adduced go a long way to prove that the accounts of the Creation and of the Deluge in the Hebrew scriptures are mere legends; and further, that the evidence for the existence and activity of a demonic world, implicitly and explicitly inculcated throughout the Christian scriptures, and universally held by the primitive Churches, is totally inadequate to justify the expression of belief in it.

This much on the negative side of the discussion. On the positive side, the essay on the "Evolution of Theology," as I imagine, shows cause for the conclusion that the Israelitic religion, in the earliest phase of which anything is really known, is neither more nor less rational, neither better nor worse ethically, than the religions of other nations in a similar state of

civilisation; that, in the natural course of its evolution, it reached, in the prophetic age, an elevation and an ethical purity which have never been surpassed; and that, since the new birth of the prophetic spirit, in the first century of our era, the course of Christian dogmatic development, along its main lines, has been essentially retrogressive. The revived prophetic ideal was gradually overshadowed by the results of Jewish and Greek theological and metaphysical speculation, and buried beneath old-world superstitions and liturgical conjurations, gradually infiltrated from the pagan surroundings of the new religion; until, in the mediæval "ages of faith," it was well-nigh smothered beneath the monstrous agglomeration of spurious doctrines and idolatrous practices.

The ordinary reader, to whom these essays are addressed, will doubtless be surprised, if not shocked, at the many passages which expressly, or by implication, contradict the notions respecting the age and authority of the Hebrew scriptures, and especially of the Pentateuch, in which he has been brought up, and which have, quite recently, received high ecclesiastical sanction. "Helps to the Study of the Bible" are proffered to lay ignorance and simplicity, and those who hunger for trustworthy information will undoubtedly find much wholesome food in the banquet set forth by the Helpers. All the more pity that some of the bread is so very full of stones. For example, the

commentary on the Pentateuch tells the student that Moses wrote or compiled the book of Genesis from documentary evidence extant in his time; that the book of Exodus was written by him, or under his immediate direction and authority; that the book of Leviticus, if not written by him, was compiled by authorised scribes under his supervision; that the book of Numbers was drawn up under his immediate oversight; that the book of Deuteronomy, containing the last addresses of the inspired legislator, specially recorded by official writers, assumed its present form under the hand of Joshua; and that the several books were enriched with numerous notes, archæological and explanatory, from the hands of later editors and revisers.[1]

Whether this view of the case implies plenary inspiration, or not, is more than I presume to say; nor do I wish to inquire whether there is, or is not, any rational foundation for it. The singularity that impresses me is the absence of the slightest hint to the ignorant layman that a large number of biblical scholars of the highest reputation, of undeniable competency and sincerity, repudiate every one of these propositions, and give an account of the origin of the Pentateuch, and of the age and authorship of its various constituents totally irreconcilable with it. There is no living biblical scholar who can ignore authorities of the

[1] The Oxford Bible for Teachers, "*Helps to the Study of the Bible*," p. 10. New Edition, 1893.

rank of Reuss and Wellhausen, of Robertson Smith and Kuenen, without gross presumption; I might even say without raising a serious doubt of his scientific integrity. But what is the general result of the patient study which these men, and many more such, have devoted, through long years, to the elucidation of the difficult and complicated problem of the origin of the first five books of the Old Testament?

An excellent work, which has just made its appearance, supplies an answer. I may be permitted to say that it can hardly be ranked as a "shallow infidel" publication; not the last, inasmuch as it is dedicated to the theological faculty of the University of Giessen; not the first, since its author, Dr. Smend, is a distinguished professor in the University of Göttingen.

After pointing out the importance of the question of the date of the priestly code (that is to say the so-called Levitical Law, which occupies so large a place in the books of Exodus, Leviticus, and Numbers), Dr. Smend says, it may now be considered to be proved, that this code "was first made known by Esra, about 444 B.C., and raised to the position of the fundamental law of Judaism. The kernel of the priestly code may be a few decades or even a century older; but it assuredly did not exist before Deuteronomy. . . . At the present day, it is almost universally admitted that there was no divine law book of

public authority in Israel before Josiah; especially, that the cultus and religious customs rested upon no divine law book; and that the chosen representatives of religion, before the exile, knew nothing whatever of such a law book.[1]

"Deuteronomy is the result of the reformatory movement set afoot by the Prophets. In fact, the Prophets, though unintentionally, became the founders of Judaism and its religion of legality. Therein lies their far-reaching historical influence. But the Prophets stand in complete antagonism to old Israel. They foretold the fall of kingdom and people, and so commenced a bitter warfare against the traditional conceptions of Israelitic religion. On the other hand, they were much more than founders of the Jewish community: they rise high above later Judaism; in them, the religion of the Old Testament substantially approaches Christianity." (*l. c.* p. 9.)

If I were to publish "Helps to the Study of Zoology" for popular use, in which the progress of science in the last fifty years was ignored and every recent authority passed over in silence, I am afraid, and indeed hope, that I should get into great trouble. But to be sure I should be judged by mere lay standards of right and wrong.

T. H. H.

HODESLEA, EASTBOURNE
October 9th, 1893.

[1] Smend, *Lehrbuch der Alttestamentlichen Religionsgeschichte*, 1893, p. 8. (Sammlung Theologischer Lehrbücher.)

CONTENTS

I

PAGE

ON THE METHOD OF ZADIG [1880] 1

(Lecture at the Working Men's College, Great Ormond Street.)

II

THE RISE AND PROGRESS OF PALÆONTOLOGY [1881] . . . 24

III

LECTURES ON EVOLUTION [NEW YORK, 1876]. 46

IV

THE INTERPRETERS OF GENESIS AND THE INTERPRETERS OF NATURE [1885] 139

V

PAGE
MR. GLADSTONE AND GENESIS [1886] 164

VI

THE LIGHTS OF THE CHURCH AND THE LIGHT OF SCIENCE [1890] 201

VII

HASISADRA'S ADVENTURE [1891] 239

VIII

THE EVOLUTION OF THEOLOGY: AN ANTHROPOLOGICAL STUDY [1886] 287

I

ON THE METHOD OF ZADIG

[1880]

RETROSPECTIVE PROPHECY AS A FUNCTION OF SCIENCE

"Une marque plus sûre que toutes celles de Zadig."—CUVIER.[1]

IT is an usual and a commendable practice to preface the discussion of the views of a philosophic thinker by some account of the man and of the circumstances which shaped his life and coloured his way of looking at things; but, though Zadig is cited in one of the most important chapters of Cuvier's greatest work, little is known about him, and that little might perhaps be better authenticated than it is.

It is said that he lived at Babylon in the time of King Moabdar; but the name of Moabdar does not appear in the list of Babylonian sovereigns

[1] "Discours sur les révolutions de la surface du globe." *Recherches sur les Ossemens Fossiles*, Ed. iv. t. i. p. 185.

brought to light by the patience and the industry of the decipherers of cuneiform inscriptions in these later years; nor indeed am I aware that there is any other authority for his existence than that of the biographer of Zadig, one Arouet de Voltaire, among whose more conspicuous merits strict historical accuracy is perhaps hardly to be reckoned.

Happily Zadig is in the position of a great many other philosophers. What he was like when he was in the flesh, indeed whether he existed at all, are matters of no great consequence. What we care about in a light is that it shows the way, not whether it is lamp or candle, tallow or wax. Our only real interest in Zadig lies in the conceptions of which he is the putative father; and his biographer has stated these with so much clearness and vivacious illustration, that we need hardly feel a pang, even if critical research should prove King Moabdar and all the rest of the story to be unhistorical, and reduce Zadig himself to the shadowy condition of a solar myth.

Voltaire tells us that, disenchanted with life by sundry domestic misadventures, Zadig withdrew from the turmoil of Babylon to a secluded retreat on the banks of the Euphrates, where he beguiled his solitude by the study of nature. The manifold wonders of the world of life had a particular attraction for the lonely student; incessant and patient observation of the plants and animals

about him sharpened his naturally good powers of observation and of reasoning; until, at length, he acquired a sagacity which enabled him to perceive endless minute differences among objects which, to the untutored eye, appeared absolutely alike.

It might have been expected that this enlargement of the powers of the mind and of its store of natural knowledge could tend to nothing but the increase of a man's own welfare and the good of his fellow-men. But Zadig was fated to experience the vanity of such expectations.

"One day, walking near a little wood, he saw, hastening that way, one of the Queen's chief eunuchs, followed by a troop of officials, who appeared to be in the greatest anxiety, running hither and thither like men distraught, in search of some lost treasure.

"'Young man,' cried the eunuch, 'have you seen the Queen's dog?' Zadig answered modestly, 'A bitch, I think, not a dog.' 'Quite right,' replied the eunuch; and Zadig continued, 'A very small spaniel who has lately had puppies; she limps with the left foreleg, and has very long ears.' 'Ah! you have seen her then,' said the breathless eunuch. 'No,' answered Zadig, 'I have not seen her; and I really was not aware that the Queen possessed a spaniel.'

"By an odd coincidence, at the very same time, the handsomest horse in the King's stables broke away from his groom in the Babylonian plains. The grand huntsman and all his staff were seeking the horse with as much anxiety as the eunuch and his people the spaniel; and the grand huntsman asked Zadig if he had not seen the King's horse go that way.

"'A first-rate galloper, small-hoofed, five feet high; tail three feet and a half long; cheek pieces of the bit of twenty-three carat gold; shoes silver?' said Zadig.

"'Which way did he go? Where is he?' cried the grand huntsman.

"'I have not seen anything of the horse, and I never heard of him before,' replied Zadig.

"The grand huntsman and the chief eunuch made sure that Zadig had stolen both the King's horse and the Queen's spaniel, so they haled him before the High Court of Desterham, which at once condemned him to the knout, and transportation for life to Siberia. But the sentence was hardly pronounced when the lost horse and spaniel were found. So the judges were under the painful necessity of reconsidering their decision: but they fined Zadig four hundred ounces of gold for saying he had seen that which he had not seen.

"The first thing was to pay the fine; afterwards Zadig was permitted to open his defence to the court, which he did in the following terms:

"'Stars of justice, abysses of knowledge, mirrors of truth, whose gravity is as that of lead, whose inflexibility is as that of iron, who rival the diamond in clearness, and possess no little affinity with gold; since I am permitted to address your august assembly, I swear by Ormuzd that I have never seen the respectable lady dog of the Queen, nor beheld the sacrosanct horse of the King of Kings.

"'This is what happened. I was taking a walk towards the little wood near which I subsequently had the honour to meet the venerable chief eunuch and the most illustrious grand huntsman. I noticed the track of an animal in the sand, and it was easy to see that it was that of a small dog. Long faint streaks upon the little elevations of sand between the footmarks convinced me that it was a she dog with pendent dugs, showing that she must have had puppies not many days since. Other scrapings of the sand, which always lay close to the marks of the forepaws, indicated that she had very long ears; and, as the imprint of one foot was always fainter than those of the other three, I judged that the lady dog of our august Queen was, if I may venture to say so, a little lame.

"'With respect to the horse of the King of Kings, permit me to observe that, wandering through the paths which traverse the

wood, I noticed the marks of horse-shoes. They were all equidistant. "Ah!" said I, "this is a famous galloper." In a narrow alley, only seven feet wide, the dust upon the trunks of the trees was a little disturbed at three feet and a half from the middle of the path. "This horse," said I to myself, "had a tail three feet and a half long, and, lashing it from one side to the other, he has swept away the dust." Branches of the trees met overhead at the height of five feet, and under them I saw newly fallen leaves; so I knew that the horse had brushed some of the branches, and was therefore five feet high. As to his bit, it must have been made of twenty-three carat gold, for he had rubbed it against a stone, which turned out to be a touchstone, with the properties of which I am familiar by experiment. Lastly, by the marks which his shoes left upon pebbles of another kind, I was led to think that his shoes were of fine silver.'

"All the judges admired Zadig's profound and subtle discernment; and the fame of it reached even the King and the Queen. From the ante-rooms to the presence-chamber, Zadig's name was in everybody's mouth; and, although many of the magi were of opinion that he ought to be burnt as a sorcerer, the King commanded that the four hundred ounces of gold which he had been fined should be restored to him. So the officers of the court went in state with the four hundred ounces; only they retained three hundred and ninety-eight for legal expenses, and their servants expected fees."

Those who are interested in learning more of the fateful history of Zadig must turn to the original; we are dealing with him only as a philosopher, and this brief excerpt suffices for the exemplification of the nature of his conclusions and of the methods by which he arrived at them.

These conclusions may be said to be of the nature of retrospective prophecies; though it is perhaps a little hazardous to employ phraseology

which perilously suggests a contradiction in terms —the word "prophecy" being so constantly, in ordinary use, restricted to "foretelling." Strictly, however, the term prophecy applies as much to outspeaking as to foretelling; and, even in the restricted sense of "divination," it is obvious that the essence of the prophetic operation does not lie in its backward or forward relation to the course of time, but in the fact that it is the apprehension of that which lies out of the sphere of immediate knowledge; the seeing of that which, to the natural sense of the seer, is invisible.

The foreteller asserts that, at some future time, a properly situated observer will witness certain events; the clairvoyant declares that, at this present time, certain things are to be witnessed a thousand miles away; the retrospective prophet (would that there were such a word as "back-teller!") affirms that, so many hours or years ago, such and such things were to be seen. In all these cases, it is only the relation to time which alters—the process of divination beyond the limits of possible direct knowledge remains the same.

No doubt it was their instinctive recognition of the analogy between Zadig's results and those obtained by authorised inspiration which inspired the Babylonian magi with the desire to burn the philosopher. Zadig admitted that he had never either seen or heard of the horse of the king or of the spaniel of the queen; and yet he ventured to assert in

the most positive manner that animals answering to their description did actually exist and ran about the plains of Babylon. If his method was good for the divination of the course of events ten hours old, why should it not be good for those of ten years or ten centuries past; nay, might it not extend ten thousand years and justify the impious in meddling with the traditions of Oannes and the fish, and all the sacred foundations of Babylonian cosmogony?

But this was not the worst. There was another consideration which obviously dictated to the more thoughtful of the magi the property of burning Zadig out of hand. His defence was worse than his offence. It showed that his mode of divination was fraught with danger to magianism in general. Swollen with the pride of human reason, he had ignored the established canons of magian lore; and, trusting to what after all was mere carnal common sense, he professed to lead men to a deeper insight into nature than magian wisdom, with all its lofty antagonism to everything common, had ever reached. What, in fact, lay at the foundation of all Zadig's arguments but the coarse commonplace assumption, upon which every act of our daily lives is based, that we may conclude from an effect to the pre-existence of a cause competent to produce that effect?

The tracks were exactly like those which dogs and horses leave; therefore they were the effects

of such animals as causes. The marks at the sides of the fore-prints of the dog track were exactly such as would be produced by long trailing ears; therefore the dog's long ears were the causes of these marks—and so on. Nothing can be more hopelessly vulgar, more unlike the majestic development of a system of grandly unintelligible conclusions from sublimely inconceivable premisses such as delights the magian heart. In fact, Zadig's method was nothing but the method of all mankind. Retrospective prophecies, far more astonishing for their minute accuracy than those of Zadig, are familiar to those who have watched the daily life of nomadic people.

From freshly broken twigs, crushed leaves, disturbed pebbles, and imprints hardly discernible by the untrained eye, such graduates in the University of Nature will divine, not only the fact that a party has passed that way, but its strength, its composition, the course it took, and the number of hours or days which have elapsed since it passed. But they are able to do this because, like Zadig, they perceive endless minute differences where untrained eyes discern nothing; and because the unconscious logic of common sense compels them to account for these effects by the causes which they know to be competent to produce them.

And such mere methodised savagery was to discover the hidden things of nature better than *a priori* deductions from the nature of Ormuzd—

perhaps to give a history of the past, in which Oannes would be altogether ignored! Decidedly it were better to burn this man at once.

If instinct, or an unwonted use of reason, led Moabdar's magi to this conclusion two or three thousand years ago, all that can be said is that subsequent history has fully justified them. For the rigorous application of Zadig's logic to the results of accurate and long-continued observation has founded all those sciences which have been termed historical or palætiological, because they are retrospectively prophetic and strive towards the reconstruction in human imagination of events which have vanished and ceased to be.

History, in the ordinary acceptation of the word, is based upon the interpretation of documentary evidence; and documents would have no evidential value unless historians were justified in their assumption that they have come into existence by the operation of causes similar to those of which documents are, in our present experience, the effects. If a written history can be produced otherwise than by human agency, or if the man who wrote a given document was actuated by other than ordinary human motives, such documents are of no more evidential value than so many arabesques.

Archæology, which takes up the thread of history beyond the point at which documentary evidence fails us, could have no existence, except

for our well grounded confidence that monuments and works of art or artifice, have never been produced by causes different in kind from those to which they now owe their origin. And geology, which traces back the course of history beyond the limits of archæology, could tell us nothing except for the assumption that, millions of years ago, water, heat, gravitation, friction, animal and vegetable life, caused effects of the same kind as they now cause. Nay, even physical astronomy, is so far as it takes us back to the uttermost point of time which palætiological science can reach, is founded upon the same assumption. If the law of gravitation ever failed to be true, even to a small extent, for that period, the calculations of the astronomer have no application.

The power of prediction, of prospective prophecy, is that which is commonly regarded as the great prerogative of physical science. And truly it is a wonderful fact that one can go into a shop and buy for a small price a book, the "Nautical Almanac," which will foretell the exact position to be occupied by one of Jupiter's moons six months hence; nay, more, that, if it were worth while, the Astronomer-Royal could furnish us with as infallible a prediction applicable to 1980 or 2980.

But astronomy is not less remarkable for its power of retrospective prophecy.

Thales, oldest of Greek philosophers, the dates

of whose birth and death are uncertain, but who flourished about 600 B.C., is said to have foretold an eclipse of the sun which took place in his time during a battle between the Medes and the Lydians. Sir George Airy has written a very learned and interesting memoir[1] in which he proves that such an eclipse was visible in Lydia on the afternoon of the 28th of May in the year 585 B.C.

No one doubts that, on the day and at the hour mentioned by the Astronomer-Royal, the people of Lydia saw the face of the sun totally obscured. But, though we implicitly believe this retrospective prophecy, it is incapable of verification. In the total absence of historical records, it is impossible even to conceive any means of ascertaining directly whether the eclipse of Thales happened or not. All that can be said is, that the prospective prophecies of the astronomer are always verified; and that, inasmuch as his retrospective prophecies are the result of following backwards, the very same method as that which invariably leads to verified results, when it is worked forwards, there is as much reason for placing full confidence in the one as in the other. Retrospective prophecy is therefore a legitimate function of astronomical science; and if it is legitimate for one science it is legitimate for

[1] "On the Eclipses of Agathocles, Thales, and Xerxes," *Philosophical Transactions*, vol. cxliii.

all; the fundamental axiom on which it rests, the constancy of the order of nature, being the common foundation of all scientific thought. Indeed, if there can be grades in legitimacy, certain branches of science have the advantage over astronomy, in so far as their retrospective prophecies are not only susceptible of verification, but are sometimes strikingly verified.

Such a science exists in that application of the principles of biology to the interpretation of the animal and vegetable remains imbedded in the rocks which compose the surface of the globe, which is called Palæontology.

At no very distant time, the question whether these so-called "fossils," were really the remains of animals and plants was hotly disputed. Very learned persons maintained that they were nothing of the kind, but a sort of concretion, or crystallisation, which had taken place within the stone in which they are found; and which simulated the forms of animal and vegetable life, just as frost on a window-pane imitates vegetation. At the present day, it would probably be impossible to find any sane advocate of this opinion; and the fact is rather surprising, that among the people from whom the circle-squarers, perpetual-motioners, flat-earth men and the like, are recruited, to say nothing of table-turners and spirit-rappers, somebody has not perceived the easy avenue to nonsensical notoriety open to any

one who will take up the good old doctrine, that fossils are all *lusus naturæ*.

The position would be impregnable, inasmuch as it is quite impossible to prove the contrary. If a man choose to maintain that a fossil oyster shell, in spite of its correspondence, down to every minutest particular, with that of an oyster fresh taken out of the sea, was never tenanted by a living oyster, but is a mineral concretion, there is no demonstrating his error. All that can be done is to show him that, by a parity of reasoning, he is bound to admit that a heap of oyster shells outside a fishmonger's door may also be "sports of nature," and that a mutton bone in a dust-bin may have had the like origin. And when you cannot prove that people are wrong, but only that they are absurd, the best course is to let them alone.

The whole fabric of palæontology, in fact, falls to the ground unless we admit the validity of Zadig's great principle, that like effects imply like causes, and that the process of reasoning from a shell, or a tooth, or a bone, to the nature of the animal to which it belonged, rests absolutely on the assumption that the likeness of this shell, or tooth, or bone, to that of some animal with which we are already acquainted, is such that we are justified in inferring a corresponding degree of likeness in the rest of the two organisms. It is on this very simple principle, and not upon imaginary

laws of physiological correlation, about which, in most cases, we know nothing whatever, that the so-called restorations of the palæontologist are based.

Abundant illustrations of this truth will occur to every one who is familiar with palæontology; none is more suitable than the case of the so-called *Belemnites*. In the early days of the study of fossils, this name was given to certain elongated stony bodies, ending at one extremity in a conical point, and truncated at the other, which were commonly reputed to be thunderbolts, and as such to have descended from the sky. They are common enough in some parts of England; and, in the condition in which they are ordinarily found, it might be difficult to give satisfactory reasons for denying them to be merely mineral bodies.

They appear, in fact, to consist of nothing but concentric layers of carbonate of lime, disposed in subcrystalline fibres, or prisms, perpendicular to the layers. Among a great number of specimens of these Belemnites, however, it was soon observed that some showed a conical cavity at the blunt end; and, in still better preserved specimens, this cavity appeared to be divided into chambers by delicate saucer-shaped partitions, situated at regular intervals one above the other. Now there is no mineral body which presents any structure comparable to this, and the conclusion suggested itself that the Belemnites must be the effects of

causes other than those which are at work in inorganic nature. On close examination, the saucer-shaped partitions were proved to be all perforated at one point, and the perforations being situated exactly in the same line, the chambers were seen to be traversed by a canal, or *siphuncle*, which thus connected the smallest or aphical chamber with the largest. There is nothing like this in the vegetable world; but an exactly corresponding structure is met with in the shells of two kinds of existing animals, the pearly *Nautilus* and the *Spirula*, and only in them. These animals belong to the same division—the *Cephalopoda*—as the cuttle-fish, the squid, and the octopus. But they are the only existing members of the group which possess chambered, siphunculated shells; and it is utterly impossible to trace any physiological connection between the very peculiar structural characters of a cephalopod and the presence of a chambered shell. In fact, the squid has, instead of any such shell, a horny "pen," the cuttle-fish has the so-called "cuttle-bone," and the octopus has no shell, or, at most, a mere rudiment of one.

Nevertheless, seeing that there is nothing in nature at all like the chambered shell of the Belemnite, except the shells of the *Nautilus* and of the *Spirula*, it was legitimate to prophesy that the animal from which the fossil proceeded must have belonged to the group of the *Cephalopoda*.

Nautilus and *Spirula* are both very rare animals, but the progress of investigation brought to light the singular fact, that, though each has the characteristic cephalopodous organisation, it is very different from the other. The shell of *Nautilus* is external, that of *Spirula* internal; *Nautilus* has four gills, *Spirula* two; *Nautilus* has multitudinous tentacles, *Spirula* has only ten arms beset with horny-rimmed suckers; *Spirula*, like the squids and cuttlefishes, which it closely resembles, has a bag of ink which it squirts out to cover its retreat when alarmed; *Nautilus* has none.

No amount of physiological reasoning could enable any one to say whether the animal which fabricated the Belemnite was more like *Nautilus*, or more like *Spirula*. But the accidental discovery of Belemnites in due connection with black elongated masses which were certainly fossilised ink-bags, inasmuch as the ink could be ground up and used for painting as well as if it were recent sepia, settled the question; and it became perfectly safe to prophesy that the creature which fabricated the Belemnite was a two-gilled cephalopod with suckers on its arms, and with all the other essential features of our living squids, cuttlefishes, and *Spirulæ*. The palæontologist was, by this time, able to speak as confidently about the animal of the Belemnite, as Zadig was respecting the queen's spaniel. He could give a very fair description of its external appearance, and even enter pretty

fully into the details of its internal organisation, and yet could declare that neither he, nor any one else, had ever seen one. And as the queen's spaniel was found, so happily has the animal of the Belemnite; a few exceptionally preserved specimens having been discovered, which completely verify the retrospective prophecy of those who interpreted the facts of the case by due application of the method of Zadig.

These Belemnites flourished in prodigious abundance in the seas of the mesozoic, or secondary, age of the world's geological history; but no trace of them has been found in any of the tertiary deposits, and they appear to have died out towards the close of the mesozoic epoch. The method of Zadig, therefore, applies in full force to the events of a period which is immeasurably remote, which long preceded the origin of the most conspicuous mountain masses of the present world, and the deposition, at the bottom of the ocean, of the rocks which form the greater part of the soil of our present continents. The Euphrates itself, at the mouth of which Oannes landed, is a thing of yesterday compared with a Belemnite; and even the liberal chronology of magian cosmogony fixes the beginning of the world only at a time when other applications of Zadig's method afford convincing evidence that, could we have been there to see, things would have looked very much as they do now. Truly the magi were wise

in their generation; they foresaw rightly that this pestilent application of the principles of common sense, inaugurated by Zadig, would be their ruin.

But it may be said that the method of Zadig, which is simple reasoning from analogy, does not account for the most striking feats of modern palæontology—the reconstruction of entire animals from a tooth or perhaps a fragment of a bone; and it may be justly urged that Cuvier, the great master of this kind of investigation, gave a very different account of the process which yielded such remarkable results.

Cuvier is not the first man of ability who has failed to make his own mental processes clear to himself, and he will not be the last. The matter can be easily tested. Search the eight volumes of the "Recherches sur les Ossemens Fossiles" from cover to cover, and nothing but the application of the method of Zadig will be found in the arguments by which a fragment of a skeleton is made to reveal the characters of the animal to which it belonged.

There is one well-known case which may represent all. It is an excellent illustration of Cuvier's sagacity, and he evidently takes some pride in telling his story about it. A split slab of stone arrived from the quarries of Montmartre, the two halves of which contained the greater part of the skeleton of a small animal. On careful examina-

tions of the characters of the teeth and of the lower jaw, which happened to be exposed, Cuvier assured himself that they presented such a very close resemblance to the corresponding parts in the living opossums that he at once assigned the fossil to that genus.

Now the opossums are unlike most mammals in that they possess two bones attached to the fore part of the pelvis, which are commonly called "marsupial bones." The name is a misnomer, originally conferred because it was thought that these bones have something to do with the support of the pouch, or marsupium, with which some, but not all, of the opossums are provided. As a matter of fact, they have nothing to do with the support of the pouch, and they exist as much in those opossums which have no pouches as in those which possess them. In truth, no one knows what the use of these bones may be, nor has any valid theory of their physiological import yet been suggested. And if we have no knowledge of the physiological importance of the bones themselves, it is obviously absurd to pretend that we are able to give physiological reasons why the presence of these bones is associated with certain peculiarities of the teeth and of the jaws. If any one knows why four molar teeth and an inflected angle of the jaw are very generally found along with marsupial bones, he has not yet communicated that knowledge to the world.

If, however, Zadig was right in concluding from the likeness of the hoof-prints which he observed to a horse's that the creature which made them had a tail like that of a horse, Cuvier, seeing that the teeth and jaw of his fossil were just like those of an opossum, had the same right to conclude that the pelvis would also be like an opossum's; and so strong was his conviction that this retrospective prophecy, about an animal which he had never seen before, and which had been dead and buried for millions of years, would be verified, that he went to work upon the slab which contained the pelvis in confident expectation of finding and laying bare the "marsupial bones," to the satisfaction of some persons whom he had invited to witness their disinterment. As he says:—"Cette opération se fit en présence de quelques personnes à qui j'en avais annoncé d'avance le résultat, dans l'intention de leur prouver par le fait la justice de nos théories zoologiques; puisque le vrai cachet d'une théorie est sans contredit la faculté qu'elle donne de prévoir les phénomènes."

In the "Ossemens Fossiles" Cuvier leaves his paper just as it first appeared in the "Annales du Muséum," as "a curious monument of the force of zoological laws and of the use which may be made of them."

Zoological laws truly, but not physiological laws. If one sees a live dog's head, it is extremely probable that a dog's tail is not far off, though nobody

can say why that sort of head and that sort of tail go together; what physiological connection there is between the two. So, in the case of the Montmartre fossil, Cuvier, finding a thorough opossum's head, concluded that the pelvis also would be like an opossum's. But, most assuredly, the most advanced physiologist of the present day could throw no light on the question why these are associated, nor could pretend to affirm that the existence of the one is necessarily connected with that of the other. In fact, had it so happened that the pelvis of the fossil had been originally exposed, while the head lay hidden, the presence of the "marsupial bones," though very like an opossum's, would by no means have warranted the prediction that the skull would turn out to be that of the opossum. It might just as well have been like that of some other marsupial; or even like that of the totally different group of Monotremes, of which the only living representatives are the *Echidna* and the *Ornithorhynchus*.

For all practical purposes, however, the empirical laws of co-ordination of structures, which are embodied in the generalisations of morphology, may be confidently trusted, if employed with due caution, to lead to a just interpretation of fossil remains; or, in other words, we may look for the verification of the retrospective prophecies which are based upon them.

And if this be the case, the late advances which have been made in palæontological discovery open out a new field for such prophecies. For it has been ascertained with respect to many groups of animals, that, as we trace them back in time, their ancestors gradually cease to exhibit those special modifications which at present characterise the type, and more nearly embody the general plan of the group to which they belong.

Thus, in the well-known case of the horse, the toes which are suppressed in the living horse are found to be more and more complete in the older members of the group, until, at the bottom of the Tertiary series of America, we find an equine animal which has four toes in front and three behind. No remains of the horse tribe are at present known from any Mesozoic deposit. Yet who can doubt that, whenever a sufficiently extensive series of lacustrine and fluviatile beds of that age becomes known, the lineage which has been traced thus far will be continued by equine quadrupeds with an increasing number of digits, until the horse type merges in the five-toed form towards which these gradations point?

But the argument which holds good for the horse, holds good, not only for all mammals, but for the whole animal world. And as the study of the pedigrees, or lines of evolution, to which, at present, we have access, brings to light, as it assuredly will do, the laws of that process, we

shall be able to reason from the facts with which the geological record furnishes us to those which have hitherto remained, and many of which, perhaps, may for ever remain, hidden. The same method of reasoning which enables us, when furnished with a fragment of an extinct animal, to prophesy the character which the whole organism exhibited, will, sooner or later, enable us, when we know a few of the later terms of a genealogical series, to predict the nature of the earlier terms.

In no very distant future, the method of Zadig, applied to a greater body of facts than the present generation is fortunate enough to handle, will enable the biologist to reconstruct the scheme of life from its beginning, and to speak as confidently of the character of long extinct living beings, no trace of which has been preserved, as Zadig did of the queen's spaniel and the king's horse. Let us hope that they may be better rewarded for their toil and their sagacity than was the Babylonian philosopher; for perhaps, by that time, the magi also may be reckoned among the members of a forgotten Fauna, extinguished in the struggle for existence against their great rival, common sense.

II

THE RISE AND PROGRESS OF PALÆONTOLOGY

[1881]

That application of the sciences of biology and geology, which is commonly known as palæontology, took its origin in the mind of the first person who, finding something like a shell, or a bone, naturally imbedded in gravel or rock, indulged in speculations upon the nature of this thing which he had dug out—this "fossil"—and upon the causes which had brought it into such a position. In this rudimentary form, a high antiquity may safely be ascribed to palæontology, inasmuch as we know that, 500 years before the Christian era, the philosophic doctrines of Xenophanes were influenced by his observations upon the fossil remains exposed in the quarries of Syracuse. From this time forth not only the philosophers, but the poets, the historians, the geographers of antiquity occasionally refer to fossils; and, after the revival of learning, lively controversies arose respecting their real nature.

But hardly more than two centuries have elapsed since this fundamental problem was first exhaustively treated; it was only in the last century that the archæological value of fossils—their importance, I mean, as records of the history of the earth—was fully recognised; the first adequate investigation of the fossil remains of any large group of vertebrated animals is to be found in Cuvier's "Recherches sur les Ossemens Fossiles," completed in 1822; and, so modern is stratigraphical palæontology, that its founder, William Smith, lived to receive the just recognition of his services by the award of the first Wollaston Medal in 1831.

But, although palæontology is a comparatively youthful scientific speciality, the mass of materials with which it has to deal is already prodigious. In the last fifty years the number of known fossil remains of invertebrated animals has been trebled or quadrupled. The work of interpretation of vertebrate fossils, the foundations of which were so solidly laid by Cuvier, was carried on, with wonderful vigour and success, by Agassiz in Switzerland, by Von Meyer in Germany, and last, but not least, by Owen in this country, while, in later years, a multitude of workers have laboured in the same field. In many groups of the animal kingdom the number of fossil forms already known is as great as that of the existing species. In some cases it is much greater; and there are

entire orders of animals of the existence of which we should know nothing except for the evidence afforded by fossil remains. With all this it may be safely assumed that, at the present moment, we are not acquainted with a tithe of the fossils which will sooner or later be discovered. If we may judge by the profusion yielded within the last few years by the Tertiary formations of North America, there seems to be no limit to the multitude of mammalian remains to be expected from that continent; and analogy leads us to expect similar riches in Eastern Asia, whenever the Tertiary formations of that region are as carefully explored. Again, we have, as yet, almost everything to learn respecting the terrestrial population of the Mesozoic epoch; and it seems as if the Western territories of the United States were about to prove as instructive in regard to this point as they have in respect of tertiary life. My friend Professor Marsh informs me that, within two years, remains of more than 160 distinct individuals of mammals, belonging to twenty species and nine genera, have been found in a space not larger than the floor of a good-sized room; while beds of the same age have yielded 300 reptiles, varying in size from a length of 60 feet or 80 feet to the dimensions of a rabbit.

The task which I have set myself to-night is to endeavour to lay before you, as briefly as possible, a sketch of the successive steps by which our

present knowledge of the facts of palæontology and of those conclusions from them which are indisputable, has been attained; and I beg leave to remind you, at the outset, that in attempting to sketch the progress of a branch of knowledge to which innumerable labours have contributed, my business is rather with generalisations than with details. It is my object to mark the epochs of palæontology, not to recount all the events of its history.

That which I just now called the fundamental problem of palæontology, the question which has to be settled before any other can be profitably discussed, is this, What is the nature of fossils? Are they, as the healthy common sense of the ancient Greeks appears to have led them to assume without hesitation, the remains of animals and plants? Or are they, as was so generally maintained in the fifteenth, sixteenth, and seventeenth centuries, mere figured stones, portions of mineral matter which have assumed the forms of leaves and shells and bones, just as those portions of mineral matter which we call crystals take on the form of regular geometrical solids? Or, again, are they, as others thought, the products of the germs of animals and of the seeds of plants which have lost their way, as it were, in the bowels of the earth, and have achieved only an imperfect and abortive development? It is easy to sneer at our ancestors for being disposed to reject the first

in favour of one or other of the last two hypotheses; but it is much more profitable to try to discover why they, who were really not one whit less sensible persons than our excellent selves, should have been led to entertain views which strike us as absurd. The belief in what is erroneously called spontaneous generation, that is to say, in the development of living matter out of mineral matter, apart from the agency of pre-existing living matter, as an ordinary occurrence at the present day—which is still held by some of us, was universally accepted as an obvious truth by them. They could point to the arborescent forms assumed by hoar-frost and by sundry metallic minerals as evidence of the existence in nature of a "plastic force" competent to enable inorganic matter to assume the form of organised bodies. Then, as every one who is familiar with fossils knows, they present innumerable gradations, from shells and bones which exactly resemble the recent objects, to masses of mere stone which, however accurately they repeat the outward form of the organic body, have nothing else in common with it; and, thence, to mere traces and faint impressions in the continuous substance of the rock. What we now know to be the results of the chemical changes which take place in the course of fossilisation, by which mineral is substituted for organic substance, might, in the absence of such knowledge, be fairly interpreted

as the expression of a process of development in the opposite direction—from the mineral to the organic. Moreover, in an age when it would have seemed the most absurd of paradoxes to suggest that the general level of the sea is constant, while that of the solid land fluctuates up and down through thousands of feet in a secular ground swell, it may well have appeared far less hazardous to conceive that fossils are sports of nature than to accept the necessary alternative, that all the inland regions and highlands, in the rocks of which marine shells had been found, had once been covered by the ocean. It is not so surprising, therefore, as it may at first seem, that although such men as Leonardo da Vinci and Bernard Palissy took just views of the nature of fossils, the opinion of the majority of their contemporaries set strongly the other way; nor even that error maintained itself long after the scientific grounds of the true interpretation of fossils had been stated, in a manner that left nothing to be desired, in the latter half of the seventeenth century. The person who rendered this good service to palæontology was Nicolas Steno, professor of anatomy in Florence, though a Dane by birth. Collectors of fossils at that day were familiar with certain bodies termed "glossopetræ," and speculation was rife as to their nature. In the first half of the seventeenth century, Fabio Colonna had tried to convince his colleagues of

the famous Accademia dei Lincei that the glossopetræ were merely fossil sharks' teeth, but his arguments made no impression. Fifty years later, Steno re-opened the question, and, by dissecting the head of a shark and pointing out the very exact correspondence of its teeth with the glossopetræ, left no rational doubt as to the origin of the latter. Thus far, the work of Steno went little further than that of Colonna, but it fortunately occurred to him to think out the whole subject of the interpretation of fossils, and the result of his meditations was the publication, in 1669, of a little treatise with the very quaint title of "De Solido intra Solidum naturaliter contento." The general course of Steno's argument may be stated in a few words. Fossils are solid bodies which, by some natural process, have come to be contained within other solid bodies, namely, the rocks in which they are embedded; and the fundamental problem of palæontology, stated generally, is this: "Given a body endowed with a certain shape and produced in accordance with natural laws, to find in that body itself the evidence of the place and manner of its production."[1] The only way of solving this problem is by the application of the axiom that "like effects imply like causes," or as Steno puts it, in

[1] *De Solido intra Solidum*, p. 5.—"Dato corpore certâ figurâ prædito et juxta leges naturæ producto, in ipso corpore argumenta invenire locum et modum productionis detegentia."

reference to this particular case, that "bodies which are altogether similar have been produced in the same way."[1] Hence, since the glossopetræ are altogether similar to sharks' teeth, they must have been produced by sharklike fishes; and since many fossil shells correspond, down to the minutest details of structure, with the shells of existing marine or freshwater animals, they must have been produced by similar animals; and the like reasoning is applied by Steno to the fossil bones of vertebrated animals, whether aquatic or terrestrial. To the obvious objection that many fossils are not altogether similar to their living analogues, differing in substance while agreeing in form, or being mere hollows or impressions, the surfaces of which are figured in the same way as those of animal or vegetable organisms, Steno replies by pointing out the changes which take place in organic remains embedded in the earth, and how their solid substance may be dissolved away entirely, or replaced by mineral matter, until nothing is left of the original but a cast, an impression, or a mere trace of its contours. The principles of investigation thus excellently stated and illustrated by Steno in 1669, are those which have, consciously or unconsciously, guided the researches of palæontologists ever since. Even that feat of palæontology which has so powerfully

[1] "Corpora sibi invicem omnino similia simili etiam modo producta sunt"

impressed the popular imagination, the reconstruction of an extinct animal from a tooth or a bone, is based upon the simplest imaginable application of the logic of Steno. A moment's consideration will show, in fact, that Steno's conclusion that the glossopetræ are sharks' teeth implies the reconstruction of an animal from its tooth. It is equivalent to the assertion that the animal of which the glossopetræ are relics had the form and organisation of a shark; that it had a skull, a vertebral column, and limbs similar to those which are characteristic of this group of fishes; that its heart, gills, and intestines presented the peculiarities which those of all sharks exhibit; nay, even that any hard parts which its integument contained were of a totally different character from the scales of ordinary fishes. These conclusions are as certain as any based upon probable reasonings can be. And they are so, simply because a very large experience justifies us in believing that teeth of this particular form and structure are invariably associated with the peculiar organisation of sharks, and are never found in connection with other organisms. Why this should be we are not at present in a position even to imagine; we must take the fact as an empirical law of animal morphology, the reason of which may possibly be one day found in the history of the evolution of the shark tribe, but for which it is hopeless to seek for an explanation in ordinary

physiological reasonings. Every one practically acquainted with palæontology is aware that it is not every tooth, nor every bone, which enables us to form a judgment of the character of the animal to which it belonged; and that it is possible to possess many teeth, and even a large portion of the skeleton of an extinct animal, and yet be unable to reconstruct its skull or its limbs. It is only when the tooth or bone presents peculiarities, which we know by previous experience to be characteristic of a certain group, that we can safely predict that the fossil belonged to an animal of the same group. Any one who finds a cow's grinder may be perfectly sure that it belonged to an animal which had two complete toes on each foot and ruminated; any one who finds a horse's grinder may be as sure that it had one complete toe on each foot and did not ruminate; but if ruminants and horses were extinct animals of which nothing but the grinders had ever been discovered, no amount of physiological reasoning could have enabled us to reconstruct either animal, still less to have divined the wide differences between the two. Cuvier, in the "Discours sur les Révolutions de la Surface du Globe," strangely credits himself, and has ever since been credited by others, with the invention of a new method of palæontological research. But if you will turn to the "Recherches sur les Ossemens Fossiles" and watch Cuvier, not speculating, but

working, you will find that his method is neither more nor less than that of Steno. If he was able to make his famous prophecy from the jaw which lay upon the surface of a block of stone to the pelvis of the same animal which lay hidden in it, it was not because either he, or any one else, knew, or knows, why a certain form of jaw is, as a rule, constantly accompanied by the presence of marsupial bones, but simply because experience has shown that these two structures are co-ordinated.

The settlement of the nature of fossils led at once to the next advance of palæontology, viz. its application to the deciphering of the history of the earth. When it was admitted that fossils are remains of animals and plants, it followed that, in so far as they resemble terrestrial, or freshwater, animals and plants, they are evidences of the existence of land, or fresh water; and, in so far as they resemble marine organisms, they are evidences of the existence of the sea at the time at which they were parts of actually living animals and plants. Moreover, in the absence of evidence to the contrary, it must be admitted that the terrestrial or the marine organisms implied the existence of land or sea at the place in which they were found while they were yet living. In fact, such conclusions were immediately drawn by everybody, from the time of Xenophanes downwards, who believed that fossils were really

organic remains. Steno discusses their value as evidence of repeated alteration of marine and terrestrial conditions upon the soil of Tuscany in a manner worthy of a modern geologist. The speculations of De Maillet in the beginning of the eighteenth century turn upon fossils; and Buffon follows him very closely in those two remarkable works, the "Théorie de la Terre" and the "Époques de la Nature" with which he commenced and ended his career as a naturalist.

The opening sentences of the "Époques de la Nature" show us how fully Buffon recognised the analogy of geological with archæological inquiries. "As in civil history we consult deeds, seek for coins, or decipher antique inscriptions in order to determine the epochs of human revolutions and fix the date of moral events; so, in natural history, we must search the archives of the world, recover old monuments from the bowels of the earth, collect their fragmentary remains, and gather into one body of evidence all the signs of physical change which may enable us to look back upon the different ages of nature. It is our only means of fixing some points in the immensity of space, and of setting a certain number of waymarks along the eternal path of time."

Buffon enumerates five classes of these monuments of the past history of the earth, and they are all facts of palæontology. In the first place, he says, shells and other marine productions

are found all over the surface and in the interior of the dry land; and all calcareous rocks are made up of their remains. Secondly, a great many of these shells which are found in Europe are not now to be met with in the adjacent seas; and, in the slates and other deep-seated deposits, there are remains of fishes and of plants of which no species now exist in our latitudes, and which are either extinct, or exist only in more northern climates. Thirdly, in Siberia and in other northern regions of Europe and of Asia, bones and teeth of elephants, rhinoceroses, and hippopotamuses occur in such numbers that these animals must once have lived and multiplied in those regions, although at the present day they are confined to southern climates. The deposits in which these remains are found are superficial, while those which contain shells and other marine remains lie much deeper. Fourthly, tusks and bones of elephants and hippopotamuses are found not only in the northern regions of the old world, but also in those of the new world, although, at present, neither elephants nor hippopotamuses occur in America. Fifthly, in the middle of the continents, in regions most remote from the sea, we find an infinite number of shells, of which the most part belong to animals of those kinds which still exist in southern seas, but of which many others have no living analogues; so that these species appear to be lost, destroyed by some unknown

cause. It is needless to inquire how far these statements are strictly accurate; they are sufficiently so to justify Buffon's conclusions that the dry land was once beneath the sea; that the formation of the fossiliferous rocks must have occupied a vastly greater lapse of time than that traditionally ascribed to the age of the earth; that fossil remains indicate different climatal conditions to have obtained in former times, and especially that the polar regions were once warmer; that many species of animals and plants have become extinct; and that geological change has had something to do with geographical distribution.

But these propositions almost constitute the frame-work of palæontology. In order to complete it but one addition was needed, and that was made, in the last years of the eighteenth century, by William Smith, whose work comes so near our own times that many living men may have been personally acquainted with him. This modest land-surveyor, whose business took him into many parts of England, profited by the peculiarly favourable conditions offered by the arrangement of our secondary strata to make a careful examination and comparison of their fossil contents at different points of the large area over which they extend. The result of his accurate and widely-extended observations was to establish the important truth that each stratum

contains certain fossils which are peculiar to it; and that the order in which the strata, characterised by these fossils, are super-imposed one upon the other is always the same. This most important generalisation was rapidly verified and extended to all parts of the world accessible to geologists; and now it rests upon such an immense mass of observations as to be one of the best established truths of natural science. To the geologist the discovery was of infinite importance as it enabled him to identify rocks of the same relative age, however their continuity might be interrupted or their composition altered. But to the biologist it had a still deeper meaning, for it demonstrated that, throughout the prodigious duration of time registered by the fossiliferous rocks, the living population of the earth had undergone continual changes, not merely by the extinction of a certain number of the species which had at first existed, but by the continual generation of new species, and the no less constant extinction of old ones.

Thus the broad outlines of palæontology, in so far as it is the common property of both the geologist and the biologist, were marked out at the close of the last century. In tracing its subsequent progress I must confine myself to the province of biology, and, indeed, to the influence of palæontology upon zoological morphology. And I accept this limitation the more willingly as the

no less important topic of the bearing of geology and of palæontology upon distribution has been luminously treated in the address of the President of the Geographical Section.[1]

The succession of the species of animals and plants in time being established, the first question which the zoologist or the botanist had to ask himself was, What is the relation of these successive species one to another? And it is a curious circumstance that the most important event in the history of palæontology which immediately succeeded William Smith's generalisation was a discovery which, could it have been rightly appreciated at the time, would have gone far towards suggesting the answer, which was in fact delayed for more than half a century. I refer to Cuvier's investigation of the mammalian fossils yielded by the quarries in the older tertiary rocks of Montmartre, among the chief results of which was the bringing to light of two genera of extinct hoofed quadrupeds, the *Anoplotherium* and the *Palæotherium*. The rich materials at Cuvier's disposition enabled him to obtain a full knowledge of the osteology and of the dentition of these two forms, and consequently to compare their structure critically with that of existing hoofed animals. The effect of this comparison was to prove that the *Anoplotherium*, though it presented many points of resemblance with the pigs on the one

[1] Sir J. D. Hooker.

hand and with the ruminants on the other, differed from both to such an extent that it could find a place in neither group. In fact, it held, in some respects, an intermediate position, tending to bridge over the interval between these two groups, which in the existing fauna are so distinct. In the same way, the *Palæotherium* tended to connect forms so different as the tapir, the rhinoceros, and the horse. Subsequent investigations have brought to light a variety of facts of the same order, the most curious and striking of which are those which prove the existence, in the mesozoic epoch, of a series of forms intermediate between birds and reptiles—two classes of vertebrate animals which at present appear to be more widely separated than any others. Yet the interval between them is completely filled, in the mesozoic fauna, by birds which have reptilian characters, on the one side, and reptiles which have ornithic characters, on the other. So again, while the group of fishes, termed ganoids, is, at the present time, so distinct from that of the dipnoi, or mudfishes, that they have been reckoned as distinct orders, the Devonian strata present us with forms of which it is impossible to say with certainty whether they are dipnoi or whether they are ganoids.

Agassiz's long and elaborate researches upon fossil fishes, published between 1833 and 1842, led him to suggest the existence of another kind of relation between ancient and modern forms of

life. He observed that the oldest fishes present many characters which recall the embryonic conditions of existing fishes; and that, not only among fishes, but in several groups of the invertebrata which have a long palæontological history, the latest forms are more modified, more specialised, than the earlier. The fact that the dentition of the older tertiary ungulate and carnivorous mammals is always complete, noticed by Professor Owen, illustrated the same generalisation.

Another no less suggestive observation was made by Mr. Darwin, whose personal investigations during the voyage of the *Beagle* led him to remark upon the singular fact, that the fauna, which immediately precedes that at present existing in any geographical province of distribution, presents the same peculiarities as its successor. Thus, in South America and in Australia, the later tertiary or quaternary fossils show that the fauna which immediately preceded that of the present day was, in the one case, as much characterised by edentates and, in the other, by marsupials as it is now, although the species of the older are largely different from those of the newer fauna.

However clearly these indications might point in one direction, the question of the exact relation of the successive forms of animal and vegetable life could be satisfactorily settled only in one way; namely, by comparing, stage by stage, the series of forms presented by one and the same type through-

out a long space of time. Within the last few years this has been done fully in the case of the horse, less completely in the case of the other principal types of the ungulata and of the carnivora; and all these investigations tend to one general result, namely, that, in any given series, the successive members of that series present a gradually increasing specialisation of structure. That is to say, if any such mammal at present existing has specially modified and reduced limbs or dentition and complicated brain, its predecessors in time show less and less modification and reduction in limbs and teeth and a less highly developed brain. The labours of Gaudry, Marsh, and Cope furnish abundant illustrations of this law from the marvellous fossil wealth of Pikermi and the vast uninterrupted series of tertiary rocks in the territories of North America.

I will now sum up the results of this sketch of the rise and progress of palæontology. The whole fabric of palæontology is based upon two propositions: the first is, that fossils are the remains of animals and plants; and the second is, that the stratified rocks in which they are found are sedimentary deposits; and each of these propositions is founded upon the same axiom, that like effects imply like causes. If there is any cause competent to produce a fossil stem, or shell, or bone, except a living being, then palæontology has no founda-

tion; if the stratification of the rocks is not the effect of such causes as at present produce stratification, we have no means of judging of the duration of past time, or of the order in which the forms of life have succeeded one another. But if these two propositions are granted, there is no escape, as it appears to me, from three very important conclusions. The first is that living matter has existed upon the earth for a vast length of time, certainly for millions of years. The second is that, during this lapse of time, the forms of living matter have undergone repeated changes, the effect of which has been that the animal and vegetable population, at any period of the earth's history, contains certain species which did not exist at some antecedent period, and others which ceased to exist at some subsequent period. The third is that, in the case of many groups of mammals and some of reptiles, in which one type can be followed through a considerable extent of geological time, the series of different forms by which the type is represented, at successive intervals of this time, is exactly such as it would be, if they had been produced by the gradual modification of the earliest forms of the series. These are facts of the history of the earth guaranteed by as good evidence as any facts in civil history.

Hitherto I have kept carefully clear of all the hypotheses to which men have at various times endeavoured to fit the facts of palæontology, or by

which they have endeavoured to connect as many of these facts as they happened to be acquainted with. I do not think it would be a profitable employment of our time to discuss conceptions which doubtless have had their justification and even their use, but which are now obviously incompatible with the well-ascertained truths of palæontology. At present these truths leave room for only two hypotheses. The first is that, in the course of the history of the earth, innumerable species of animals and plants have come into existence, independently of one another, innumerable times. This, of course, implies either that spontaneous generation on the most astounding scale, and of animals such as horses and elephants, has been going on, as a natural process, through all the time recorded by the fossiliferous rocks; or it necessitates the belief in innumerable acts of creation repeated innumerable times. The other hypothesis is, that the successive species of animals and plants have arisen, the later by the gradual modification of the earlier. This is the hypothesis of evolution; and the palæontological discoveries of the last decade are so completely in accordance with the requirements of this hypothesis that, if it had not existed, the palæontologist would have had to invent it.

I have always had a certain horror of presuming to set a limit upon the possibilities of things. Therefore I will not venture to say that it is impossible that the multitudinous species of animals

and plants may have been produced, one separately from the other, by spontaneous generation; nor that it is impossible that they should have been independently originated by an endless succession of miraculous creative acts. But I must confess that both these hypotheses strike me as so astoundingly improbable, so devoid of a shred of either scientific or traditional support, that even if there were no other evidence than that of palæontology in its favour, I should feel compelled to adopt the hypothesis of evolution. Happily, the future of palæontology is independent of all hypothetical considerations. Fifty years hence, whoever undertakes to record the progress of palæontology will note the present time as the epoch in which the law of succession of the forms of the higher animals was determined by the observation of palæontological facts. He will point out that, just as Steno and as Cuvier were enabled from their knowledge of the empirical laws of co-existence of the parts of animals to conclude from a part to the whole, so the knowledge of the law of succession of forms empowered their successors to conclude, from one or two terms of such a succession, to the whole series; and thus to divine the existence of forms of life, of which, perhaps, no trace remains, at epochs of inconceivable remoteness in the past.

III

LECTURES ON EVOLUTION

[1876]

I

THE THREE HYPOTHESES RESPECTING THE HISTORY OF NATURE

We live in and form part of a system of things of immense diversity and perplexity, which we call Nature; and it is a matter of the deepest interest to all of us that we should form just conceptions of the constitution of that system and of its past history. With relation to this universe, man is, in extent, little more than a mathematical point; in duration but a fleeting shadow; he is a mere reed shaken in the winds of force. But as Pascal long ago remarked, although a mere reed, he is a thinking reed; and in virtue of that wonderful capacity of thought, he has the power of framing for himself a symbolic conception of the universe,

which, although doubtless highly imperfect and inadequate as a picture of the great whole, is yet sufficient to serve him as a chart for the guidance of his practical affairs. It has taken long ages of toilsome and often fruitless labour to enable man to look steadily at the shifting scenes of the phantasmagoria of Nature, to notice what is fixed among her fluctuations, and what is regular among her apparent irregularities; and it is only comparatively lately, within the last few centuries, that the conception of a universal order and of a definite course of things, which we term the course of Nature, has emerged.

But, once originated, the conception of the constancy of the order of Nature has become the dominant idea of modern thought. To any person who is familiar with the facts upon which that conception is based, and is competent to estimate their significance, it has ceased to be conceivable that chance should have any place in the universe, or that events should depend upon any but the natural sequence of cause and effect. We have come to look upon the present as the child of the past and as the parent of the future; and, as we have excluded chance from a place in the universe, so we ignore, even as a possibility, the notion of any interference with the order of Nature. Whatever may be men's speculative doctrines, it is quite certain that every intelligent person guides his life and risks his fortune upon the belief that the order

of Nature is constant, and that the chain of natural causation is never broken.

In fact, no belief which we entertain has so complete a logical basis as that to which I have just referred. It tacitly underlies every process of reasoning; it is the foundation of every act of the will. It is based upon the broadest induction, and it is verified by the most constant, regular, and universal of deductive processes. But we must recollect that any human belief, however broad its basis, however defensible it may seem, is, after all, only a probable belief, and that our widest and safest generalisations are simply statements of the highest degree of probability. Though we are quite clear about the constancy of the order of Nature, at the present time, and in the present state of things, it by no means necessarily follows that we are justified in expanding this generalisation into the infinite past, and in denying, absolutely, that there may have been a time when Nature did not follow a fixed order, when the relations of cause and effect were not definite, and when extra-natural agencies interfered with the general course of Nature. Cautious men will allow that a universe so different from that which we know may have existed; just as a very candid thinker may admit that a world in which two and two do not make four, and in which two straight lines do inclose a space, may exist. But the same caution which forces the admission of

such possibilities demands a great deal of evidence before it recognises them to be anything more substantial. And when it is asserted that, so many thousand years ago, events occurred in a manner utterly foreign to and inconsistent with the existing laws of Nature, men, who without being particularly cautious, are simply honest thinkers, unwilling to deceive themselves or delude others, ask for trustworthy evidence of the fact.

Did things so happen or did they not? This is a historical question, and one the answer to which must be sought in the same way as the solution of any other historical problem.

So far as I know, there are only three hypotheses which ever have been entertained, or which well can be entertained, respecting the past history of Nature. I will, in the first place, state the hypotheses, and then I will consider what evidence bearing upon them is in our possession, and by what light of criticism that evidence is to be interpreted.

Upon the first hypothesis, the assumption is, that phenomena of Nature similar to those exhibited by the present world have always existed; in other words, that the universe has existed, from all eternity, in what may be broadly termed its present condition.

The second hypothesis is that the present state

of things has had only a limited duration; and that, at some period in the past, a condition of the world, essentially similar to that which we now know, came into existence, without any precedent condition from which it could have naturally proceeded. The assumption that successive states of Nature have arisen, each without any relation of natural causation to an antecedent state, is a mere modification of this second hypothesis.

The third hypothesis also assumes that the present state of things has had but a limited duration; but it supposes that this state has been evolved by a natural process from an antecedent state, and that from another, and so on; and, on this hypothesis, the attempt to assign any limit to the series of past changes is, usually, given up.

It is so needful to form clear and distinct notions of what is really meant by each of these hypotheses that I will ask you to imagine what, according to each, would have been visible to a spectator of the events which constitute the history of the earth. On the first hypothesis, however far back in time that spectator might be placed, he would see a world essentially, though perhaps not in all its details, similar to that which now exists. The animals which existed would be the ancestors of those which now live, and similar to them; the plants, in like manner, would be such as we know; and the mountains, plains, and waters would foreshadow the salient features of our present land

and water. This view was held more or less distinctly, sometimes combined with the notion of recurrent cycles of change, in ancient times; and its influence has been felt down to the present day. It is worthy of remark that it is a hypothesis which is not inconsistent with the doctrine of Uniformitarianism, with which geologists are familiar. That doctrine was held by Hutton, and in his earlier days by Lyell. Hutton was struck by the demonstration of astronomers that the perturbations of the planetary bodies, however great they may be, yet sooner or later right themselves; and that the solar system possesses a self-adjusting power by which these aberrations are all brought back to a mean condition. Hutton imagined that the like might be true of terrestrial changes; although no one recognised more clearly than he the fact that the dry land is being constantly washed down by rain and rivers and deposited in the sea; and that thus, in a longer or shorter time, the inequalities of the earth's surface must be levelled, and its high lands brought down to the ocean. But, taking into account the internal forces of the earth, which, upheaving the sea-bottom give rise to new land, he thought that these operations of degradation and elevation might compensate each other; and that thus, for any assignable time, the general features of our planet might remain what they are. And inasmuch as, under these circumstances, there need be no limit to the

propagation of animals and plants, it is clear that the consistent working-out of the uniformitarian idea might lead to the conception of the eternity of the world. Not that I mean to say that either Hutton or Lyell held this conception—assuredly not; they would have been the first to repudiate it. Nevertheless, the logical development of some of their arguments tends directly towards this hypothesis.

The second hypothesis supposes that the present order of things, at some no very remote time, had a sudden origin, and that the world, such as it now is, had chaos for its phenomenal antecedent. That is the doctrine which you will find stated most fully and clearly in the immortal poem of John Milton—the English *Divina Commedia*—"Paradise Lost." I believe it is largely to the influence of that remarkable work, combined with the daily teachings to which we have all listened in our childhood, that this hypothesis owes its general wide diffusion as one of the current beliefs of English-speaking people. If you turn to the seventh book of "Paradise Lost," you will find there stated the hypothesis to which I refer, which is briefly this: That this visible universe of ours came into existence at no great distance of time from the present; and that the parts of which it is composed made their appearance, in a certain definite order, in the space of six natural days, in such a manner that, on the first of these days,

light appeared; that, on the second, the firmament, or sky, separated the waters above, from the waters beneath the firmament; that, on the third day, the waters drew away from the dry land, and upon it a varied vegetable life, similar to that which now exists, made its appearance; that the fourth day was signalised by the apparition of the sun, the stars, the moon, and the planets; that, on the fifth day, aquatic animals originated within the waters; that, on the sixth day, the earth gave rise to our four-footed terrestrial creatures, and to all varieties of terrestrial animals except birds, which had appeared on the preceding day; and, finally, that man appeared upon the earth, and the emergence of the universe from chaos was finished. Milton tells us, without the least ambiguity, what a spectator of these marvellous occurrences would have witnessed. I doubt not that his poem is familiar to all of you, but I should like to recall one passage to your minds, in order that I may be justified in what I have said regarding the perfectly concrete, definite, picture of the origin of the animal world which Milton draws. He says:—

"The sixth, and of creation last, arose
With evening harps and matin, when God said,
'Let the earth bring forth soul living in her kind,
Cattle and creeping things, and beast of the earth,
Each in their kind!' The earth obeyed, and, straight
Opening her fertile womb, teemed at a birth
Innumerous living creatures, perfect forms,

Limbed and full-grown. Out of the ground uprose,
As from his lair, the wild beast, where he wons
In forest wild, in thicket, brake, or den;
Among the trees in pairs they rose, they walked;
The cattle in the fields and meadows green;
Those rare and solitary; these in flocks
Pasturing at once, and in broad herds upsprung.
The grassy clods now calved; now half appears
The tawny lion, pawing to get free
His hinder parts—then springs, as broke from bonds,
And rampant shakes his brinded mane; the ounce,
The libbard, and the tiger, as the mole
Rising, the crumbled earth above them threw
In hillocks; the swift stag from underground
Bore up his branching head; scarce from his mould
Behemoth, biggest born of earth, upheaved
His vastness; fleeced the flocks and bleating rose
As plants; ambiguous between sea and land,
The river-horse and scaly crocodile.
At once came forth whatever creeps the ground,
Insect or worm."

There is no doubt as to the meaning of this statement, nor as to what a man of Milton's genius expected would have been actually visible to an eye-witness of this mode of origination of living things.

The third hypothesis, or the hypothesis of evolution, supposes that, at any comparatively late period of past time, our imaginary spectator would meet with a state of things very similar to that which now obtains; but that the likeness of the past to the present would gradually become less and less, in proportion to the remoteness of his period of observation from the present day; that

the existing distribution of mountains and plains, of rivers and seas, would show itself to be the product of a slow process of natural change operating upon more and more widely different antecedent conditions of the mineral frame-work of the earth; until, at length, in place of that framework, he would behold only a vast nebulous mass, representing the constituents of the sun and of the planetary bodies. Preceding the forms of life which now exist, our observer would see animals and plants, not identical with them, but like them, increasing their differences with their antiquity and, at the same time, becoming simpler and simpler; until, finally, the world of life would present nothing but that undifferentiated protoplasmic matter which, so far as our present knowledge goes, is the common foundation of all vital activity.

The hypothesis of evolution supposes that in all this vast progression there would be no breach of continuity, no point at which we could say "This is a natural process," and "This is not a natural process;" but that the whole might be compared to that wonderful operation of development which may be seen going on every day under our eyes, in virtue of which there arises, out of the semi-fluid comparatively homogeneous substance which we call an egg, the complicated organisation of one of the higher animals. That, in a few words, is what is meant by the hypothesis of evolution.

I have already suggested that, in dealing with these three hypotheses, in endeavouring to form a judgment as to which of them is the more worthy of belief, or whether none is worthy of belief—in which case our condition of mind should be that suspension of judgment which is so difficult to all but trained intellects—we should be indifferent to all *a priori* considerations. The question is a question of historical fact. The universe has come into existence somehow or other, and the problem is, whether it came into existence in one fashion, or whether it came into existence in another; and, as an essential preliminary to further discussion, permit me to say two or three words as to the nature and the kinds of historical evidence.

The evidence as to the occurrence of any event in past time may be ranged under two heads which, for convenience' sake, I will speak of as testimonial evidence and as circumstantial evidence. By testimonial evidence I mean human testimony; and by circumstantial evidence I mean evidence which is not human testimony. Let me illustrate by a familiar example what I understand by these two kinds of evidence, and what is to be said respecting their value.

Suppose that a man tells you that he saw a person strike another and kill him; that is testimonial evidence of the fact of murder. But it is possible to have circumstantial evidence of the fact of murder; that is to say, you may find a

man dying with a wound upon his head having exactly the form and character of the wound which is made by an axe, and, with due care in taking surrounding circumstances into account, you may conclude with the utmost certainty that the man has been murdered; that his death is the consequence of a blow inflicted by another man with that implement. We are very much in the habit of considering circumstantial evidence as of less value than testimonial evidence, and it may be that, where the circumstances are not perfectly clear and intelligible, it is a dangerous and unsafe kind of evidence; but it must not be forgotten that, in many cases, circumstantial is quite as conclusive as testimonial evidence, and that, not unfrequently, it is a great deal weightier than testimonial evidence. For example, take the case to which I referred just now. The circumstantial evidence may be better and more convincing than the testimonial evidence; for it may be impossible, under the conditions that I have defined, to suppose that the man met his death from any cause but the violent blow of an axe wielded by another man. The circumstantial evidence in favour of a murder having been committed, in that case, is as complete and as convincing as evidence can be. It is evidence which is open to no doubt and to no falsification. But the testimony of a witness is open to multitudinous doubts. He may have been mistaken. He

may have been actuated by malice. It has constantly happened that even an accurate man has declared that a thing has happened in this, that, or the other way, when a careful analysis of the circumstantial evidence has shown that it did not happen in that way, but in some other way.

We may now consider the evidence in favour of or against the three hypotheses. Let me first direct your attention to what is to be said about the hypothesis of the eternity of the state of things in which we now live. What will first strike you is, that it is a hypothesis which, whether true or false, is not capable of verification by any evidence. For, in order to obtain either circumstantial or testimonial evidence sufficient to prove the eternity of duration of the present state of nature, you must have an eternity of witnesses or an infinity of circumstances, and neither of these is attainable. It is utterly impossible that such evidence should be carried beyond a certain point of time; and all that could be said, at most, would be, that so far as the evidence could be traced, there was nothing to contradict the hypothesis. But when you look, not to the testimonial evidence—which, considering the relative insignificance of the antiquity of human records, might not be good for much in this case—but to the circumstantial evidence, then you find that this hypothesis is absolutely incompatible with such evidence as we have;

which is of so plain and so simple a character that it is impossible in any way to escape from the conclusions which it forces upon us.

You are, doubtless, all aware that the outer substance of the earth, which alone is accessible to direct observation, is not of a homogeneous character, but that it is made up of a number of layers or strata, the titles of the principal groups of which are placed upon the accompanying diagram. Each of these groups represents a number of beds of sand, of stone, of clay, of slate, and of various other materials.

On careful examination, it is found that the materials of which each of these layers of more or less hard rock are composed are, for the most part, of the same nature as those which are at present being formed under known conditions on the surface of the earth. For example, the chalk, which constitutes a great part of the Cretaceous formation in some parts of the world, is practically identical in its physical and chemical characters with a substance which is now being formed at the bottom of the Atlantic Ocean, and covers an enormous area; other beds of rock are comparable with the sands which are being formed upon sea-shores, packed together, and so on. Thus, omitting rocks of igneous origin, it is demonstrable that all these beds of stone, of which a total of not less than seventy thousand feet is known, have been formed by natural

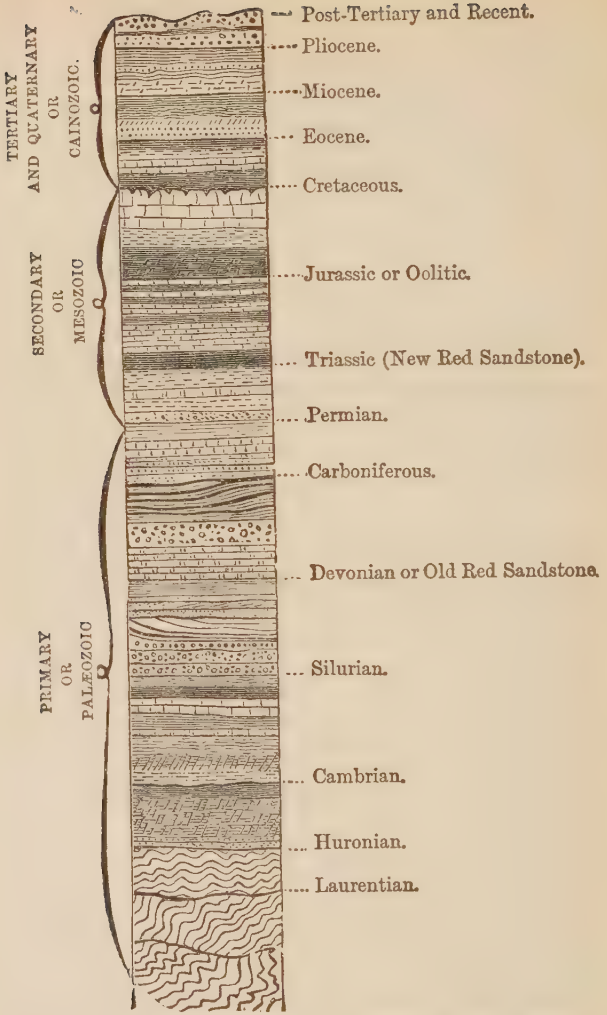

FIG. 1.—IDEAL SECTION OF THE CRUST OF THE EARTH.

agencies, either out of the waste and washing of the dry land, or else by the accumulation of the exuviæ of plants and animals. Many of these strata are full of such exuviæ—the so-called "fossils." Remains of thousands of species of animals and plants, as perfectly recognisable as those of existing forms of life which you meet with in museums, or as the shells which you pick up upon the sea-beach, have been imbedded in the ancient sands, or muds, or limestones, just as they are being imbedded now, in sandy, or clayey, or calcareous subaqueous deposits. They furnish us with a record, the general nature of which cannot be misinterpreted, of the kinds of things that have lived upon the surface of the earth during the time that is registered by this great thickness of stratified rocks. But even a superficial study of these fossils shows us that the animals and plants which live at the present time have had only a temporary duration; for the remains of such modern forms of life are met with, for the most part, only in the uppermost or latest tertiaries, and their number rapidly diminishes in the lower deposits of that epoch. In the older tertiaries, the places of existing animals and plants are taken by other forms, as numerous and diversified as those which live now in the same localities, but more or less different from them; in the mesozoic rocks, these are replaced by others yet more divergent from modern types; and, in the palæozoic formations, the

contrast is still more marked. Thus the circumstantial evidence absolutely negatives the conception of the eternity of the present condition of things. We can say, with certainty, that the present condition of things has existed for a comparatively short period; and that, so far as animal and vegetable nature are concerned, it has been preceded by a different condition. We can pursue this evidence until we reach the lowest of the stratified rocks, in which we lose the indications of life altogether. The hypothesis of the eternity of the present state of nature may therefore be put out of court.

We now come to what I will term Milton's hypothesis—the hypothesis that the present condition of things has endured for a comparatively short time; and, at the commencement of that time, came into existence within the course of six days. I doubt not that it may have excited some surprise in your minds that I should have spoken of this as Milton's hypothesis, rather than that I should have chosen the terms which are more customary, such as "the doctrine of creation," or "the Biblical doctrine," or "the doctrine of Moses," all of which denominations, as applied to the hypothesis to which I have just referred, are certainly much more familiar to you than the title of the Miltonic hypothesis. But I have had what I cannot but think are very weighty reasons for taking the course which I have pursued. In

the first place, I have discarded the title of the "doctrine of creation," because my present business is not with the question why the objects which constitute Nature came into existence, but when they came into existence, and in what order. This is as strictly a historical question as the question when the Angles and the Jutes invaded England, and whether they preceded or followed the Romans. But the question about creation is a philosophical problem, and one which cannot be solved, or even approached, by the historical method. What we want to learn is, whether the facts, so far as they are known, afford evidence that things arose in the way described by Milton, or whether they do not; and, when that question is settled, it will be time enough to inquire into the causes of their origination.

In the second place, I have not spoken of this doctrine as the Biblical doctrine. It is quite true that persons as diverse in their general views as Milton the Protestant and the celebrated Jesuit Father Suarez, each put upon the first chapter of Genesis the interpretation embodied in Milton's poem. It is quite true that this interpretation is that which has been instilled into every one of us in our childhood; but I do not for one moment venture to say that it can properly be called the Biblical doctrine. It is not my business, and does not lie within my competency, to say what the Hebrew text does, and what it does not

signify; moreover, were I to affirm that this is the Biblical doctrine, I should be met by the authority of many eminent scholars, to say nothing of men of science, who, at various times, have absolutely denied that any such doctrine is to be found in Genesis. If we are to listen to many expositors of no mean authority, we must believe that what seems so clearly defined in Genesis—as if very great pains had been taken that there should be no possibility of mistake—is not the meaning of the text at all. The account is divided into periods that we may make just as long or as short as convenience requires. We are also to understand that it is consistent with the original text to believe that the most complex plants and animals may have been evolved by natural processes, lasting for millions of years, out of structureless rudiments. A person who is not a Hebrew scholar can only stand aside and admire the marvellous flexibility of a language which admits of such diverse interpretations. But assuredly, in the face of such contradictions of authority upon matters respecting which he is incompetent to form any judgment, he will abstain, as I do, from giving any opinion.

In the third place, I have carefully abstained from speaking of this as the Mosaic doctrine, because we are now assured upon the authority of the highest critics, and even of dignitaries of the Church, that there is no evidence that Moses

wrote the Book of Genesis, or knew anything about it. You will understand that I give no judgment—it would be an impertinence upon my part to volunteer even a suggestion—upon such a subject. But, that being the state of opinion among the scholars and the clergy, it is well for the unlearned in Hebrew lore, and for the laity, to avoid entangling themselves in such a vexed question. Happily, Milton leaves us no excuse for doubting what he means, and I shall therefore be safe in speaking of the opinion in question as the Miltonic hypothesis.

Now we have to test that hypothesis. For my part, I have no prejudice one way or the other. If there is evidence in favour of this view, I am burdened by no theoretical difficulties in the way of accepting it; but there must be evidence. Scientific men get an awkward habit—no, I won't call it that, for it is a valuable habit—of believing nothing unless there is evidence for it; and they have a way of looking upon belief which is not based upon evidence, not only as illogical, but as immoral. We will, if you please, test this view by the circumstantial evidence alone; for, from what I have said, you will understand that I do not propose to discuss the question of what testimonial evidence is to be adduced in favour of it. If those whose business it is to judge are not at one as to the authenticity of the only evidence of that kind which is offered, nor as to the facts to

which it bears witness, the discussion of such evidence is superfluous.

But I may be permitted to regret this necessity of rejecting the testimonial evidence the less, because the examination of the circumstantial evidence leads to the conclusion, not only that it is incompetent to justify the hypothesis, but that, so far as it goes, it is contrary to the hypothesis.

The considerations upon which I base this conclusion are of the simplest possible character. The Miltonic hypothesis contains assertions of a very definite character relating to the succession of living forms. It is stated that plants, for example, made their appearance upon the third day, and not before. And you will understand that what the poet means by plants are such plants as now live, the ancestors, in the ordinary way of propagation of like by like, of the trees and shrubs which flourish in the present world. It must needs be so; for, if they were different, either the existing plants have been the result of a separate origination since that described by Milton, of which we have no record, nor any ground for supposition that such an occurrence has taken place; or else they have arisen by a process of evolution from the original stocks.

In the second place, it is clear that there was no animal life before the fifth day, and that, on the fifth day, aquatic animals and birds appeared.

And it is further clear that terrestrial living things, other than birds, made their appearance upon the sixth day and not before. Hence, it follows that, if, in the large mass of circumstantial evidence as to what really has happened in the past history of the globe we find indications of the existence of terrestrial animals, other than birds, at a certain period, it is perfectly certain that all that has taken place, since that time, must be referred to the sixth day.

In the great Carboniferous formation, whence America derives so vast a proportion of her actual and potential wealth, in the beds of coal which have been formed from the vegetation of that period, we find abundant evidence of the existence of terrestrial animals. They have been described, not only by European but by your own naturalists. There are to be found numerous insects allied to our cockroaches. There are to be found spiders and scorpions of large size, the latter so similar to existing scorpions that it requires the practised eye of the naturalist to distinguish them. Inasmuch as these animals can be proved to have been alive in the Carboniferous epoch, it is perfectly clear that, if the Miltonic account is to be accepted, the huge mass of rocks extending from the middle of the Palæozoic formations to the uppermost members of the series, must belong to the day which is termed by Milton the sixth. But, further, it is expressly stated that aquatic

animals took their origin on the fifth day, and not before; hence, all formations in which remains of aquatic animals can be proved to exist, and which therefore testify that such animals lived at the time when these formations were in course of deposition, must have been deposited during or since the period which Milton speaks of as the fifth day. But there is absolutely no fossiliferous formation in which the remains of aquatic animals are absent. The oldest fossils in the Silurian rocks are exuviæ of marine animals; and if the view which is entertained by Principal Dawson and Dr. Carpenter respecting the nature of the *Eozoön* be well-founded, aquatic animals existed at a period as far antecedent to the deposition of the coal as the coal is from us; inasmuch as the *Eozoön* is met with in those Laurentian strata which lie at the bottom of the series of stratified rocks. Hence it follows, plainly enough, that the whole series of stratified rocks, if they are to be brought into harmony with Milton, must be referred to the fifth and sixth days, and that we cannot hope to find the slightest trace of the products of the earlier days in the geological record. When we consider these simple facts, we see how absolutely futile are the attempts that have been made to draw a parallel between the story told by so much of the crust of the earth as is known to us and the story which Milton tells. The whole series of fossiliferous stratified

rocks must be referred to the last two days; and neither the Carboniferous, nor any other, formation can afford evidence of the work of the third day.

Not only is there this objection to any attempt to establish a harmony between the Miltonic account and the facts recorded in the fossiliferous rocks, but there is a further difficulty. According to the Miltonic account, the order in which animals should have made their appearance in the stratified rocks would be this: Fishes, including the great whales, and birds; after them, all varieties of terrestrial animals except birds. Nothing could be further from the facts as we find them; we know of not the slightest evidence of the existence of birds before the Jurassic, or perhaps the Triassic, formation; while terrestrial animals, as we have just seen, occur in the Carboniferous rocks.

If there were any harmony between the Miltonic account and the circumstantial evidence, we ought to have abundant evidence of the existence of birds in the Carboniferous, the Devonian, and the Silurian rocks. I need hardly say that this is not the case, and that not a trace of birds makes its appearance until the far later period which I have mentioned.

And again, if it be true that all varieties of fishes and the great whales, and the like, made their appearance on the fifth day, we ought to find

the remains of these animals in the older rocks—in those which were deposited before the Carboniferous epoch. Fishes we do find, in considerable number and variety; but the great whales are absent, and the fishes are not such as now live. Not one solitary species of fish now in existence is to be found in the Devonian or Silurian formations. Hence we are introduced afresh to the dilemma which I have already placed before you: either the animals which came into existence on the fifth day were not such as those which are found at present, are not the direct and immediate ancestors of those which now exist; in which case, either fresh creations of which nothing is said, or a process of evolution, must have occurred; or else the whole story must be given up, as not only devoid of any circumstantial evidence, but contrary to such evidence as exists.

I placed before you in a few words, some little time ago, a statement of the sum and substance of Milton's hypothesis. Let me now try to state as briefly, the effect of the circumstantial evidence bearing upon the past history of the earth which is furnished, without the possibility of mistake, with no chance of error as to its chief features, by the stratified rocks. What we find is, that the great series of formations represents a period of time of which our human chronologies hardly afford us a unit of measure. I will not pretend to say how we ought to estimate this time, in

millions or in billions of years. For my purpose, the determination of its absolute duration is wholly unessential. But that the time was enormous there can be no question.

It results from the simplest methods of interpretation, that leaving out of view certain patches of metamorphosed rocks, and certain volcanic products, all that is now dry land has once been at the bottom of the waters. It is perfectly certain that, at a comparatively recent period of the world's history—the Cretaceous epoch—none of the great physical features which at present mark the surface of the globe existed. It is certain that the Rocky Mountains were not. It is certain that the Himalaya Mountains were not. It is certain that the Alps and the Pyrenees had no existence. The evidence is of the plainest possible character, and is simply this:—We find raised up on the flanks of these mountains, elevated by the forces of upheaval which have given rise to them, masses of Cretaceous rock which formed the bottom of the sea before those mountains existed. It is therefore clear that the elevatory forces which gave rise to the mountains operated subsequently to the Cretaceous epoch; and that the mountains themselves are largely made up of the materials deposited in the sea which once occupied their place. As we go back in time, we meet with constant alternations of sea and land, of estuary and open ocean; and,

in correspondence with these alternations, we observe the changes in the fauna and flora to which I have referred.

But the inspection of these changes give us no right to believe that there has been any discontinuity in natural processes. There is no trace of general cataclysms, of universal deluges, or sudden destructions of a whole fauna or flora. The appearances which were formerly interpreted in that way have all been shown to be delusive, as our knowledge has increased and as the blanks which formerly appeared to exist between the different formations have been filled up. That there is no absolute break between formation and formation, that there has been no sudden disappearance of all the forms of life and replacement of them by others, but that changes have gone on slowly and gradually, that one type has died out and another has taken its place, and that thus, by insensible degrees, one fauna has been replaced by another, are conclusions strengthened by constantly increasing evidence. So that within the whole of the immense period indicated by the fossiliferous stratified rocks, there is assuredly not the slightest proof of any break in the uniformity of Nature's operations, no indication that events have followed other than a clear and orderly sequence.

That, I say, is the natural and obvious teaching of the circumstantial evidence contained in the

stratified rocks. I leave you to consider how far, by any ingenuity of interpretation, by any stretching of the meaning of language, it can be brought into harmony with the Miltonic hypothesis.

There remains the third hypothesis, that of which I have spoken as the hypothesis of evolution; and I purpose that, in lectures to come, we should discuss it as carefully as we have considered the other two hypotheses. I need not say that it is quite hopeless to look for testimonial evidence of evolution. The very nature of the case precludes the possibility of such evidence, for the human race can no more be expected to testify to its own origin, than a child can be tendered as a witness of its own birth. Our sole inquiry is, what foundation circumstantial evidence lends to the hypothesis, or whether it lends none, or whether it controverts the hypothesis. I shall deal with the matter entirely as a question of history. I shall not indulge in the discussion of any speculative probabilities. I shall not attempt to show that Nature is unintelligible unless we adopt some such hypothesis. For anything I know about the matter, it may be the way of Nature to be unintelligible; she is often puzzling, and I have no reason to suppose that she is bound to fit herself to our notions.

I shall place before you three kinds of evidence entirely based upon what is known of the forms of animal life which are contained in the series

of stratified rocks. I shall endeavour to show you that there is one kind of evidence which is neutral, which neither helps evolution nor is inconsistent with it. I shall then bring forward a second kind of evidence which indicates a strong probability in favour of evolution, but does not prove it; and, lastly, I shall adduce a third kind of evidence which, being as complete as any evidence which we can hope to obtain upon such a subject, and being wholly and strikingly in favour of evolution, may fairly be called demonstrative evidence of its occurrence.

LECTURES ON EVOLUTION

II

THE HYPOTHESIS OF EVOLUTION. THE NEUTRAL AND THE FAVOURABLE EVIDENCE.

In the preceding lecture I pointed out that there are three hypotheses which may be entertained, and which have been entertained, respecting the past history of life upon the globe. According to the first of these hypotheses, living beings, such as now exist, have existed from all eternity upon this earth. We tested that hypothesis by the circumstantial evidence, as I called it, which is furnished by the fossil remains contained in the earth's crust, and we found that it was obviously untenable. I then proceeded to consider the second hypothesis, which I termed the Miltonic hypothesis, not because it is of any particular consequence whether John Milton seriously entertained it or not, but because it is stated in a clear and unmistakable manner in his great poem. I pointed out to you that the evidence at our command as completely and fully negatives that hypothesis as it did the

preceding one. And I confess that I had too much respect for your intelligence to think it necessary to add that the negation was equally clear and equally valid, whatever the source from which that hypothesis might be derived, or whatever the authority by which it might be supported. I further stated that, according to the third hypothesis, or that of evolution, the existing state of things is the last term of a long series of states, which, when traced back, would be found to show no interruption and no breach in the continuity of natural causation. I propose, in the present and the following lecture, to test this hypothesis rigorously by the evidence at command, and to inquire how far that evidence can be said to be indifferent to it, how far it can be said to be favourable to it, and, finally, how far it can be said to be demonstrative.

From almost the origin of the discussions about the existing condition of the animal and vegetable worlds and the causes which have determined that condition, an argument has been put forward as an objection to evolution, which we shall have to consider very seriously. It is an argument which was first clearly stated by Cuvier in his criticism of the doctrines propounded by his great contemporary, Lamarck. The French expedition to Egypt had called the attention of learned men to the wonderful store of antiquities in that country, and there had been brought back to

France numerous mummified corpses of the animals which the ancient Egyptians revered and preserved, and which, at a reasonable computation, must have lived not less than three or four thousand years before the time at which they were thus brought to light. Cuvier endeavoured to test the hypothesis that animals have undergone gradual and progressive modifications of structure, by comparing the skeletons and such other parts of the mummies as were in a fitting state of preservation, with the corresponding parts of the representatives of the same species now living in Egypt. He arrived at the conviction that no appreciable change had taken place in these animals in the course of this considerable lapse of time, and the justice of his conclusion is not disputed.

It is obvious that, if it can be proved that animals have endured, without undergoing any demonstrable change of structure, for so long a period as four thousand years, no form of the hypothesis of evolution which assumes that animals undergo a constant and necessary progressive change can be tenable ; unless, indeed, it be further assumed that four thousand years is too short a time for the production of a change sufficiently great to be detected.

But it is no less plain that if the process of evolution of animals is not independent of surrounding conditions; if it may be indefinitely

hastened or retarded by variations in these conditions; or if evolution is simply a process of accommodation to varying conditions; the argument against the hypothesis of evolution based on the unchanged character of the Egyptian fauna is worthless. For the monuments which are coeval with the mummies testify as strongly to the absence of change in the physical geography and the general conditions of the land of Egypt, for the time in question, as the mummies do to the unvarying characters of its living population.

The progress of research since Cuvier's time has supplied far more striking examples of the long duration of specific forms of life than those which are furnished by the mummified Ibises and Crocodiles of Egypt. A remarkable case is to be found in your own country, in the neighbourhood of the falls of Niagara. In the immediate vicinity of the whirlpool, and again upon Goat Island, in the superficial deposits which cover the surface of the rocky subsoil in those regions, there are found remains of animals in perfect preservation, and among them, shells belonging to exactly the same species as those which at present inhabit the still waters of Lake Erie. It is evident, from the structure of the country, that these animal remains were deposited in the beds in which they occur at a time when the lake extended over the region in which they are found. This involves the conclusion that they lived and

died before the falls had cut their way back through the gorge of Niagara; and, indeed, it has been determined that, when these animals lived, the falls of Niagara must have been at least six miles further down the river than they are at present. Many computations have been made of the rate at which the falls are thus cutting their way back. Those computations have varied greatly, but I believe I am speaking within the bounds of prudence, if I assume that the falls of Niagara have not retreated at a greater pace than about a foot a year. Six miles, speaking roughly, are 30,000 feet; 30,000 feet, at a foot a year, gives 30,000 years; and thus we are fairly justified in concluding that no less a period than this has passed since the shell-fish, whose remains are left in the beds to which I have referred, were living creatures.

But there is still stronger evidence of the long duration of certain types. I have already stated that, as we work our way through the great series of the Tertiary formations, we find many species of animals identical with those which live at the present day, diminishing in numbers, it is true, but still existing, in a certain proportion, in the oldest of the Tertiary rocks. Furthermore, when we examine the rocks of the Cretaceous epoch, we find the remains of some animals which the closest scrutiny cannot show to be, in any important respect, different from those which live at

the present time. That is the case with one of the cretaceous lamp-shells (*Terebratula*), which has continued to exist unchanged, or with insignificant variations, down to the present day. Such is the case with the *Globigerinæ*, the skeletons of which, aggregated together, form a large proportion of our English chalk. Those *Globigerinæ* can be traced down to the *Globigerinæ* which live at the surface of the present great oceans, and the remains of which, falling to the bottom of the sea, give rise to a chalky mud. Hence it must be admitted that certain existing species of animals show no distinct sign of modification, or transformation, in the course of a lapse of time as great as that which carries us back to the Cretaceous period; and which, whatever its absolute measure, is certainly vastly greater than thirty thousand years.

There are groups of species so closely allied together, that it needs the eye of a naturalist to distinguish them one from another. If we disregard the small differences which separate these forms, and consider all the species of such groups as modifications of one type, we shall find that, even among the higher animals, some types have had a marvellous duration. In the chalk, for example, there is found a fish belonging to the highest and the most differentiated group of osseous fishes, which goes by the name of *Beryx*. The remains of that fish are among the most

beautiful and well-preserved of the fossils found in our English chalk. It can be studied anatomically, so far as the hard parts are concerned, almost as well as if it were a recent fish. But the genus *Beryx* is represented, at the present day, by very closely allied species which are living in the Pacific and Atlantic Oceans. We may go still farther back. I have already referred to the fact, that the Carboniferous formations, in Europe and in America, contain the remains of scorpions in an admirable state of preservation, and that those scorpions are hardly distinguishable from such as now live. I do not mean to say that they are not different, but close scrutiny is needed in order to distinguish them from modern scorpions.

More than this. At the very bottom of the Silurian series, in beds which are by some authorities referred to the Cambrian formation, where the signs of life begin to fail us—even there, among the few and scanty animal remains which are discoverable, we find species of molluscous animals which are so closely allied to existing forms that, at one time, they were grouped under the same generic name. I refer to the well-known *Lingula* of the *Lingula* flags, lately, in consequence of some slight differences, placed in the new genus *Lingulella*. Practically, it belongs to the same great generic group as the *Lingula*, which is to be found at the present day upon your own shores and those of many other parts of the world.

The same truth is exemplified if we turn to certain great periods of the earth's history—as, for example, the Mesozoic epoch. There are groups of reptiles, such as the *Ichthyosauria* and the *Plesiosauria*, which appear shortly after the commencement of this epoch, and they occur in vast numbers. They disappear with the chalk and, throughout the whole of the great series of Mesozoic rocks, they present no such modifications as can safely be considered evidence of progressive modification.

Facts of this kind are undoubtedly fatal to any form of the doctrine of evolution which postulates the supposition that there is an intrinsic necessity, on the part of animal forms which have once come into existence, to undergo continual modification ; and they are as distinctly opposed to any view which involves the belief, that such modification as may occur, must take place, at the same rate, in all the different types of animal or vegetable life. The facts, as I have placed them before you, obviously directly contradict any form of the hypothesis of evolution which stands in need of these two postulates.

But, one great service that has been rendered by Mr. Darwin to the doctrine of evolution in general is this: he has shown that there are two chief factors in the process of evolution: one of them is the tendency to vary, the existence of which in all living forms may be proved by

observation; the other is the influence of surrounding conditions upon what I may call the parent form and the variations which are thus evolved from it. The cause of the production of variations is a matter not at all properly understood at present. Whether variation depends upon some intricate machinery—if I may use the phrase—of the living organism itself, or whether it arises through the influence of conditions upon that form, is not certain, and the question may, for the present, be left open. But the important point is that, granting the existence of the tendency to the production of variations; then, whether the variations which are produced shall survive and supplant the parent, or whether the parent form shall survive and supplant the variations, is a matter which depends entirely on those conditions which give rise to the struggle for existence. If the surrounding conditions are such that the parent form is more competent to deal with them, and flourish in them than the derived forms, then, in the struggle for existence, the parent form will maintain itself and the derived forms will be exterminated. But if, on the contrary, the conditions are such as to be more favourable to a derived than to the parent form, the parent form will be extirpated and the derived form will take its place. In the first case, there will be no progression, no change of structure, through any imaginable series of ages; in the second place

there will be modification of change and form.

Thus the existence of these persistent types, as I have termed them, is no real obstacle in the way of the theory of evolution. Take the case of the scorpions to which I have just referred. No doubt, since the Carboniferous epoch, conditions have always obtained, such as existed when the scorpions of that epoch flourished; conditions in which scorpions find themselves better off, more competent to deal with the difficulties in their way, than any variation from the scorpion type which they may have produced; and, for that reason, the scorpion type has persisted, and has not been supplanted by any other form. And there is no reason, in the nature of things, why, as long as this world exists, if there be conditions more favourable to scorpions than to any variation which may arise from them, these forms of life should not persist.

Therefore, the stock objection to the hypothesis of evolution, based on the long duration of certain animal and vegetable types, is no objection at all. The facts of this character—and they are numerous—belong to that class of evidence which I have called indifferent. That is to say, they may afford no direct support to the doctrine of evolution, but they are capable of being interpreted in perfect consistency with it.

There is another order of facts belonging to the class of negative or indifferent evidence. The

great group of Lizards, which abound in the present world, extends through the whole series of formations as far back as the Permian, or latest Palæozoic, epoch. These Permian lizards differ astonishingly little from the lizards which exist at the present day. Comparing the amount of the differences between them and modern lizards, with the prodigious lapse of time between the Permian epoch and the present age, it may be said that the amount of change is insignificant. But, when we carry our researches farther back in time, we find no trace of lizards, nor of any true reptile whatever, in the whole mass of formations beneath the Permian.

Now, it is perfectly clear that if our palæontological collections are to be taken, even approximately, as an adequate representation of all the forms of animals and plants that have ever lived; and if the record furnished by the known series of beds of stratified rock covers the whole series of events which constitute the history of life on the globe, such a fact as this directly contravenes the hypothesis of evolution; because this hypothesis postulates that the existence of every form must have been preceded by that of some form little different from it. Here, however, we have to take into consideration that important truth so well insisted upon by Lyell and by Darwin—the imperfection of the geological record. It can be demonstrated that the geological record must

be incomplete, that it can only preserve remains found in certain favourable localities and under particular conditions; that it must be destroyed by processes of denudation, and obliterated by processes of metamorphosis. Beds of rock of any thickness, crammed full of organic remains, may yet, either by the percolation of water through them, or by the influence of subterranean heat, lose all trace of these remains, and present the appearance of beds of rock formed under conditions in which living forms were absent. Such metamorphic rocks occur in formations of all ages; and, in various cases, there are very good grounds for the belief that they have contained organic remains, and that those remains have been absolutely obliterated.

I insist upon the defects of the geological record the more because those who have not attended to these matters are apt to say, "It is all very well, but, when you get into a difficulty with your theory of evolution, you appeal to the incompleteness and the imperfection of the geological record;" and I want to make it perfectly clear to you that this imperfection is a great fact, which must be taken into account in all our speculations, or we shall constantly be going wrong.

You see the singular series of footmarks, drawn of its natural size in the large diagram hanging up here (Fig. 2), which I owe to the kindness

of my friend Professor Marsh, with whom I had the opportunity recently of visiting the precise locality in Massachusetts in which these tracks occur. I am, therefore, able to give you my own testimony, if needed, that the diagram accurately represents what we saw. The valley of the Connecticut is classical ground for the geologist. It contains great beds of sandstone, covering many square miles, which have evidently formed a part of an ancient sea-shore, or, it may be, lake-shore. For a certain period of time after their deposition, these beds have remained sufficiently soft to

FIG. 2.—TRACKS OF BRONTOZOUM.

receive the impressions of the feet of whatever animals walked over them, and to preserve them afterwards, in exactly the same way as such impressions are at this hour preserved on the shores of the Bay of Fundy and elsewhere. The diagram represents the track of some gigantic animal, which walked on its hind legs. You see the series of marks made alternately by the right and by the left foot; so that, from one impression to the other of the three-toed foot on the same side, is one stride, and that stride, as we mea-

sured it, is six feet nine inches. I leave you, therefore, to form an impression of the magnitude of the creature which, as it walked along the ancient shore, made these impressions.

Of such impressions there are untold thousands upon these sandstones. Fifty or sixty different kinds have been discovered, and they cover vast areas. But, up to this present time, not a bone, not a fragment, of any one of the animals which left these great footmarks has been found; in fact, the only animal remains which have been met with in all these deposits, from the time of their discovery to the present day—though they have been carefully hunted over—is a fragmentary skeleton of one of the smaller forms. What has become of the bones of all these animals? You see we are not dealing with little creatures, but with animals that make a step of six feet nine inches; and their remains must have been left somewhere. The probability is, that they have been dissolved away, and completely lost.

I have had occasion to work out the nature of fossil remains, of which there was nothing left except casts of the bones, the solid material of the skeleton having been dissolved out by percolating water. It was a chance, in this case, that the sandstone happened to be of such a constitution as to set, and to allow the bones to be afterward dissolved out, leaving cavities of the exact shape of the bones. Had that constitution been other

than what it was, the bones would have been dissolved, the layers of sandstone would have fallen together into one mass, and not the slightest indication that the animal had existed would have been discoverable.

I know of no more striking evidence than these facts afford, of the caution which should be used in drawing the conclusion, from the absence of organic remains in a deposit, that animals or plants did not exist at the time it was formed. I believe that, with a right understanding of the doctrine of evolution on the one hand, and a just estimation of the importance of the imperfection of the geological record on the other, all difficulty is removed from the kind of evidence to which I have adverted; and that we are justified in believing that all such cases are examples of what I have designated negative or indifferent evidence —that is to say, they in no way directly advance the hypothesis of evolution, but they are not to be regarded as obstacles in the way of our belief in that doctrine.

I now pass on to the consideration of those cases which, for reasons which I will point out to you by and by, are not to be regarded as demonstrative of the truth of evolution, but which are such as must exist if evolution be true, and which therefore are, upon the whole, evidence in favour of the doctrine. If the doctrine of evolution be true, it follows, that, however diverse the different

groups of animals and of plants may be, they must all, at one time or other, have been connected by gradational forms; so that, from the highest animals, whatever they may be, down to the lowest speck of protoplasmic matter in which life can be manifested, a series of gradations, leading from one end of the series to the other, either exists or has existed. Undoubtedly that is a necessary postulate of the doctrine of evolution. But when we look upon living Nature as it is, we find a totally different state of things. We find that animals and plants fall into groups, the different members of which are pretty closely allied together, but which are separated by definite, larger or smaller, breaks, from other groups. In other words, no intermediate forms which bridge over these gaps or intervals are, at present, to be met with.

To illustrate what I mean: Let me call your attention to those vertebrate animals which are most familiar to you, such as mammals, birds, and reptiles. At the present day, these groups of animals are perfectly well-defined from one another. We know of no animal now living which, in any sense, is intermediate between the mammal and the bird, or between the bird and the reptile; but, on the contrary, there are many very distinct anatomical peculiarities, well-defined marks, by which the mammal is separated from the bird, and the bird from the reptile. The

distinctions are obvious and striking if you compare the definitions of these great groups as they now exist.

The same may be said of many of the subordinate groups, or orders, into which these great classes are divided. At the present time, for example, there are numerous forms of non-ruminant pachyderms, or what we may call broadly, the pig tribe, and many varieties of ruminants. These latter have their definite characteristics, and the former have their distinguishing peculiarities. But there is nothing that fills up the gap between the ruminants and the pig tribe. The two are distinct. Such also is the case in respect of the minor groups of the class of reptiles. The existing fauna shows us crocodiles, lizards, snakes, and tortoises; but no connecting link between the crocodile and lizard, nor between the lizard and snake, nor between the snake and the crocodile, nor between any two of these groups. They are separated by absolute breaks. If, then, it could be shown that this state of things had always existed, the fact would be fatal to the doctrine of evolution. If the intermediate gradations, which the doctrine of evolution requires to have existed between these groups, are not to be found anywhere in the records of the past history of the globe, their absence is a strong and weighty negative argument against evolution; while, on the other hand, if such intermediate forms are to

be found, that is so much to the good of evolution; although for reasons which I will lay before you by and by, we must be cautious in our estimate of the evidential cogency of facts of this kind.

It is a very remarkable circumstance that, from the commencement of the serious study of fossil remains, in fact, from the time when Cuvier began his brilliant researches upon those found in the quarries of Montmartre, palæontology has shown what she was going to do in this matter, and what kind of evidence it lay in her power to produce.

I said just now that, in the existing Fauna, the group of pig-like animals and the group of ruminants are entirely distinct; but one of the first of Cuvier's discoveries was an animal which he called the *Anoplotherium*, and which proved to be, in a great many important respects, intermediate in character between the pigs, on the one hand, and the ruminants on the other. Thus, research into the history of the past did, to a certain extent, tend to fill up the breach between the group of ruminants and the group of pigs. Another remarkable animal restored by the great French palæontologist, the *Palæotherium*, similarly tended to connect together animals to all appearance so different as the rhinoceros, the horse, and the tapir. Subsequent research has brought to light multitudes of facts of the same order; and,

at the present day, the investigations of such anatomists as Rütimeyer and Gaudry have tended to fill up, more and more, the gaps in our existing series of mammals, and to connect groups formerly thought to be distinct.

But I think it may have an especial interest if, instead of dealing with these examples, which would require a great deal of tedious osteological detail, I take the case of birds and reptiles; groups which, at the present day, are so clearly distinguished from one another that there are perhaps no classes of animals which, in popular apprehension, are more completely separated. Existing birds, as you are aware, are covered with feathers; their anterior extremities, specially and peculiarly modified, are converted into wings, by the aid of which most of them are able to fly; they walk upright upon two legs; and these limbs, when they are considered anatomically, present a great number of exceedingly remarkable peculiarities, to which I may have occasion to advert incidentally as I go on, and which are not met with, even approximately, in any existing forms of reptiles. On the other hand, existing reptiles have no feathers. They may have naked skins, or be covered with horny scales, or bony plates, or with both. They possess no wings; they neither fly by means of their fore-limbs, nor habitually walk upright upon their hind-limbs; and the bones of their legs present no such modifications as we find in birds. It is impossible to

imagine any two groups more definitely and distinctly separated, notwithstanding certain characters which they possess in common.

As we trace the history of birds back in time, we find their remains, sometimes in great abundance, throughout the whole extent of the tertiary rocks; but, so far as our present knowledge goes, the birds of the tertiary rocks retain the same essential characters as the birds of the present day. In other words, the tertiary birds come within the definition of the class constituted by existing birds, and are as much separated from reptiles as existing birds are. Not very long ago no remains of birds had been found below the tertiary rocks, and I am not sure but that some persons were prepared to demonstrate that they could not have existed at an earlier period. But, in the course of the last few years, such remains have been discovered in England; though, unfortunately, in so imperfect and fragmentary a condition, that it is impossible to say whether they differed from existing birds in any essential character or not. In your country the development of the cretaceous series of rocks is enormous; the conditions under which the later cretaceous strata have been deposited are highly favourable to the preservation of organic remains; and the researches, full of labour and risk, which have been carried on by Professor Marsh in these cretaceous rocks of Western America, have rewarded him with the discovery of forms of birds of which we had hitherto no concep-

tion. By his kindness, I am enabled to place before you a restoration of one of these extraordinary birds, every part of which can be thoroughly justified by the more or less complete skeletons, in a very perfect state of preservation, which he has discovered. This *Hesperornis* (Fig. 3), which measured between five and six feet in length, is astonishingly like our existing divers or grebes in a great many respects; so like them indeed that, had the skeleton of *Hesperornis* been found in a museum without its skull, it probably would have been placed in the same group of birds as the divers and grebes of the present day.[1] But *Hesperornis* differs from all existing birds, and so far resembles reptiles, in one important particular —it is provided with teeth. The long jaws are armed with teeth which have curved crowns and thick roots (Fig. 4), and are not set in distinct sockets, but are lodged in a groove. In possessing true teeth, the *Hesperornis* differs from every existing bird, and from every bird yet discovered in the tertiary formations, the tooth-like serrations of the jaws in the *Odontopteryx* of the London clay being mere processes of the bony substance of the jaws, and not teeth in the proper sense of the word. In view of the characteristics of this bird we are

[1] The absence of any keel on the breast-bone and some other osteological peculiarities, observed by Professor Marsh, however, suggest that *Hesperornis* may be a modification of a less specialised group of birds than that to which these existing aquatic birds belong.

therefore obliged to modify the definitions of the classes of birds and reptiles. Before the discovery

FIG. 3.—HESPERORNIS REGALIS (Marsh).

of *Hesperornis*, the definition of the class Aves based upon our knowledge of existing birds might

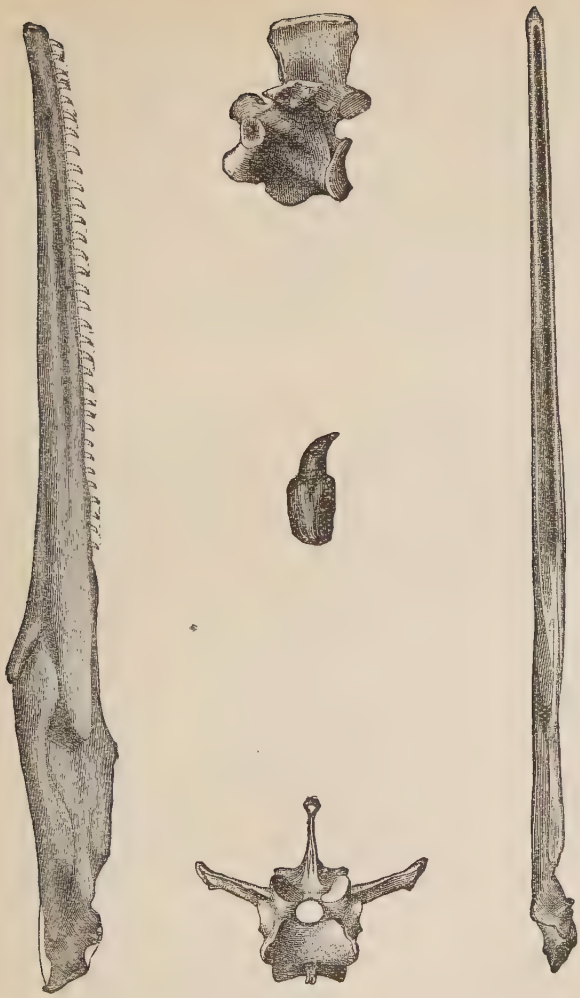

FIG. 4.—HESPERORNIS REGALIS (Marsh).

(Side and upper views of half the lower jaw; side and end views of a vertebra and a separate tooth.)

have been extended to all birds; it might have been said that the absence of teeth was characteristic of the class of birds; but the discovery of an animal which, in every part of its skeleton, closely agrees with existing birds, and yet possesses teeth, shows that there were ancient birds which, in respect of possessing teeth, approached reptiles more nearly than any existing bird does, and, to that extent, diminishes the *hiatus* between the two classes.

The same formation has yielded another bird *Ichthyornis* (Fig. 5), which also possesses teeth; but the teeth are situated in distinct sockets, while those of *Hesperornis* are not so lodged. The latter also has such very small, almost rudimentary wings, that it must have been chiefly a swimmer and a diver like a Penguin; while *Ichthyornis* has strong wings and no doubt possessed corresponding powers of flight. *Ichthyornis* also differed in the fact that its vertebræ have not the peculiar characters of the vertebræ of existing and of all known tertiary birds, but were concave at each end. This discovery leads us to make a further modification in the definition of the group of birds, and to part with another of the characters by which almost all existing birds are distinguished from reptiles.

Apart from the few fragmentary remains from the English greensand, to which I have referred, the Mesozoic rocks, older than those in which

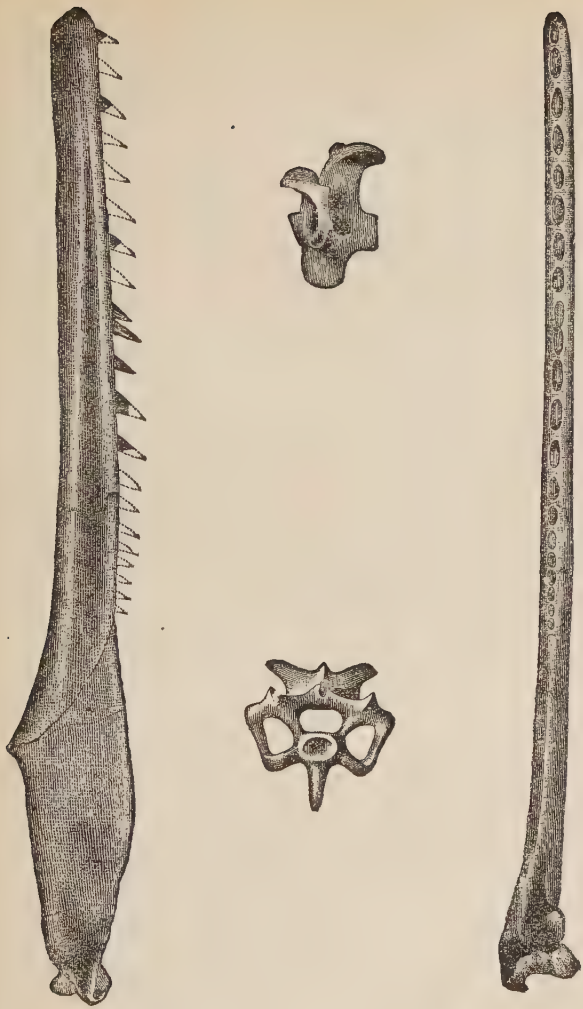

FIG. 5.—ICHTHYORNIS DISPAR (Marsh).

(Side and upper views of half the lower jaw; and side and end views of a vertebra.)

Hesperornis and *Ichthyornis* have been discovered have afforded no certain evidence of birds, with the remarkable exception of the Solenhofen slates. These so-called slates are composed of a fine grained calcareous mud which has hardened into lithographic stone, and in which organic remains are almost as well preserved as they would be if they had been imbedded in so much plaster of Paris. They have yielded the *Archæopteryx*, the existence of which was first made known by the finding of a fossil feather, or rather of the impression of one. It is wonderful enough that such a perishable thing as a feather, and nothing more, should be discovered; yet, for a long time, nothing was known of this bird except its feather. But by and by a solitary skeleton was discovered which is now in the British Museum. The skull of this solitary specimen is unfortunately wanting, and it is therefore uncertain whether the *Archæopteryx* possessed teeth or not.[1] But the remainder of the skeleton is so well preserved as to leave no doubt respecting the main features of the animal, which are very singular. The feet are not only altogether bird-like, but have the special characters of the feet of perching birds, while the body had a clothing of true feathers. Nevertheless, in some other respects, *Archæopteryx* is unlike a bird and like a reptile. There is a long tail composed of

[1] A second specimen, discovered in 1877, and at present in the Berlin museum, shows an excellently preserved skull with teeth; and three digits, all terminated by claws, in the fore limb. 1893.

many vertebræ. The structure of the wing differs in some very remarkable respects from that which it presents in a true bird. In the latter, the end of the wing answers to the thumb and two fingers of my hand; but the metacarpal bones, or those which answer to the bones of the fingers which lie in the palm of the hand, are fused together into one mass; and the whole apparatus, except the last joints of the thumb, is bound up in a sheath of integument, while the edge of the hand carries the principal quill-feathers. In the *Archæopteryx*, the upper-arm bone is like that of a bird; and the two bones of the forearm are more or less like those of a bird, but the fingers are not bound together—they are free. What their number may have been is uncertain; but several, if not all, of them were terminated by strong curved claws, not like such as are sometimes found in birds, but such as reptiles possess; so that, in the *Archæopteryx*, we have an animal which, to a certain extent, occupies a midway place between a bird and a reptile. It is a bird so far as its foot and sundry other parts of its skeleton are concerned; it is essentially and thoroughly a bird by its feathers; but it is much more properly a reptile in the fact that the region which represents the hand has separate bones, with claws resembling those which terminate the fore-limb of a reptile. Moreover, it had a long reptile-like tail with a fringe of feathers on each side; while, in all true birds

hitherto known, the tail is relatively short, and the vertebræ which constitute its skeleton are generally peculiarly modified.

Like the *Anoplotherium* and the *Palæotherium*, therefore, *Archæopteryx* tends to fill up the interval between groups which, in the existing world, are widely separated, and to destroy the value of the definitions of zoological groups based upon our knowledge of existing forms. And such cases as these constitute evidence in favour of evolution, in so far as they prove that, in former periods of the world's history, there were animals which overstepped the bounds of existing groups, and tended to merge them into larger assemblages. They show that animal organisation is more flexible than our knowledge of recent forms might have led us to believe; and that many structural permutations and combinations, of which the present world gives us no indication, may nevertheless have existed.

But it by no means follows, because the *Palæotherium* has much in common with the horse, on the one hand, and with the rhinoceros on the other, that it is the intermediate form through which rhinoceroses have passed to become horses, or *vice versâ*; on the contrary, any such supposition would certainly be erroneous. Nor do I think it likely that the transition from the reptile to the bird has been effected by such a form as *Archæopteryx*. And it is convenient to distinguish these intermediate forms between two groups, which do

not represent the actual passage from the one group to the other, as *intercalary* types, from those *linear* types which, more or less approximately, indicate the nature of the steps by which the transition from one group to the other was effected.

I conceive that such linear forms, constituting a series of natural gradations between the reptile and the bird, and enabling us to understand the manner in which the reptilian has been metamorphosed into the bird type, are really to be found among a group of ancient and extinct terrestrial reptiles known as the *Ornithoscelida*. The remains of these animals occur throughout the series of mesozoic formations, from the Trias to the Chalk, and there are indications of their existence even in the later Palæozoic strata.

Most of these reptiles, at present known, are of great size, some having attained a length of forty feet or perhaps more. The majority resembled lizards and crocodiles in their general form, and many of them were, like crocodiles, protected by an armour of heavy bony plates. But, in others, the hind limbs elongate and the fore limbs shorten, until their relative proportions approach those which are observed in the short-winged, flightless, ostrich tribe among birds.

The skull is relatively light, and in some cases the jaws, though bearing teeth, are beak-like at their extremities and appear to have been enveloped in a horny sheath. In the part of the vertebral column which lies between the haunch bones and

is called the sacrum, a number of vertebræ may unite together into one whole, and in this respect, as in some details of its structure, the sacrum of these reptiles approaches that of birds.

But it is in the structure of the pelvis and of the hind limb that some of these ancient reptiles present the most remarkable approximation to birds, and clearly indicate the way by which the most specialised and characteristic features of the bird may have been evolved from the corresponding parts in the reptile.

In Fig. 6, the pelvis and hind limbs of a crocodile, a three-toed bird, and an ornithoscelidan are represented side by side; and, for facility of comparison, in corresponding positions; but it must be recollected that, while the position of the bird's limb is natural, that of the crocodile is not so. In the bird, the thigh-bone lies close to the body, and the metatarsal bones of the foot (ii., iii., iv., Fig. 6) are, ordinarily, raised into a more or less vertical position; in the crocodile, the thigh-bone stands out at an angle from the body, and the metatarsal bones (i., ii., iii., iv., Fig. 6) lie flat on the ground. Hence, in the crocodile, the body usually lies squat between the legs, while, in the bird, it is raised upon the hind legs, as upon pillars.

In the crocodile, the pelvis is obviously composed of three bones on each side: the ilium (*Il.*), the Pubis (*Pb.*), and the ischium (*Is.*). In the adult bird there appears to be but one bone on

each side. The examination of the pelvis of a chick, however, shows that each half is made up of three bones, which answer to those which remain distinct throughout life in the crocodile. There is, therefore, a fundamental identity of plan in the construction of the pelvis of both bird and reptile; though the difference in form, relative size, and direction of the corresponding bones in the two cases are very great.

But the most striking contrast between the two lies in the bones of the leg and of that part of the foot termed the tarsus, which follows upon the leg. In the crocodile, the fibula (*F*) is relatively large and its lower end is complete. The tibia (*T*) has no marked crest at its upper end, and its lower end is narrow and not pulley-shaped. There are two rows of separate tarsal bones (*As.*, *Ca.*, *&c.*) and four distinct metatarsal bones, with a rudiment of a fifth.

In the bird, the fibula is small and its lower end diminishes to a point. The tibia has a strong crest at its upper end and its lower extremity passes into a broad pulley. There seem at first to be no tarsal bones; and only one bone, divided at the end into three heads for the three toes which are attached to it, appears in the place of the metatarsus.

In a young bird, however, the pulley-shaped apparent end of the tibia is a distinct bone, which represents the bones marked *As.*, *Ca.*, in the crocodile; while the apparently single metatarsal bone

consists of three bones, which early unite with one another and with an additional bone, which represents the lower row of bones in the tarsus of the crocodile.

In other words, it can be shown by the study of development that the bird's pelvis and hind limb are simply extreme modifications of the same fundamental plan as that upon which these parts are modelled in reptiles.

On comparing the pelvis and hind limb of the ornithoscelidan with that of the crocodile, on the one side, and that of the bird, on the other (Fig. 6), it is obvious that it represents a middle term between the two. The pelvic bones approach the form of those of the birds, and the direction of the pubis and ischium is nearly that which is characteristic of birds; the thigh bone, from the direction of its head, must have lain close to the body; the tibia has a great crest; and, immovably fitted on to its lower end, there is a pulley-shaped bone, like that of the bird, but remaining distinct. The lower end of the fibula is much more slender, proportionally, than in the crocodile. The metatarsal bones have such a form that they fit together immovably, though they do not enter into bony union; the third toe is, as in the bird, longest and strongest. In fact, the ornithoscelidan limb is comparable to that of an unhatched chick.

Taking all these facts together, it is obvious that the view, which was entertained by Mantell and the probability of which was demonstrated by

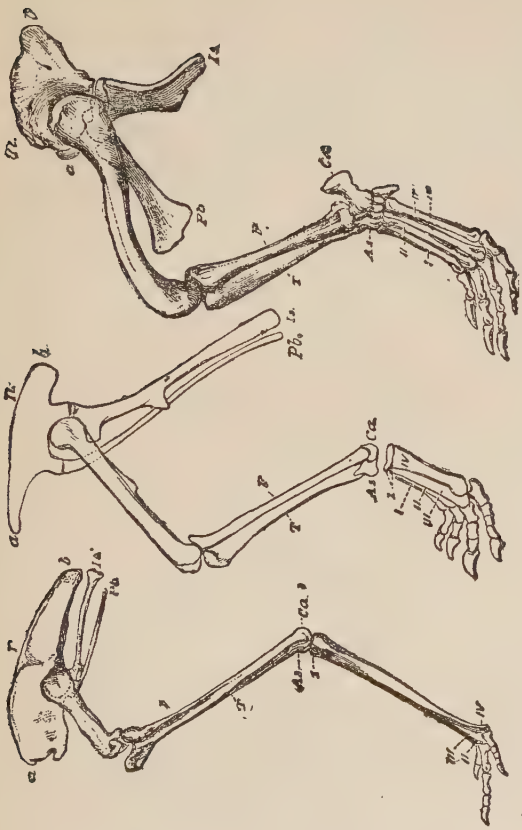

FIG. 6.—BIRD. ORNITHOSCELIDAN. CROCODILE.

The letters have the same signification in all the figures. *Il.*, Ilium; *a*, anterior end; *b*, posterior end; *Is.*, ischium; *Pb.*, pubis; *T*, tibia; *F*, fibula; *As.*, astragalus; *Ca.*, calcaneum; *l*, distal portion of the tarsus; i., ii., iii., iv., metatarsal bones.)

your own distinguished anatomist, Leidy while much additional evidence in the same direction has been furnished by Professor Cope, that some

of these animals may have walked upon their hind legs, as birds do, acquires great weight. In fact, there can be no reasonable doubt that one of the smaller forms of the *Ornithoscelida*, *Compsognathus*, the almost entire skeleton of which has been discovered in the Solenhofen slates, was a bipedal animal. The parts of this skeleton are somewhat

FIG. 7.—RESTORATION OF COMPSOGNATHUS LONGIPES.

twisted out of their natural relations, but the accompanying figure gives a just view of the general form of *Compsognathus* and of the proportions of its limbs; which, in some respects, are more completely bird-like than those of other *Ornithoscelida*.

We have had to stretch the definition of the class of birds so as to include birds with teeth and birds with paw-like fore-limbs and long tails. There is no evidence that *Compsognathus* possessed feathers ; but, if it did, it would be hard indeed to say whether it should be called a reptilian bird or an avian reptile.

As *Compsognathus* walked upon its hind legs, it must have made tracks like those of birds. And as the structure of the limbs of several of the gigantic *Ornithoscelida*, such as *Iguandon*, leads to the conclusion that they also may have constantly, or occasionally, assumed the same attitude, a peculiar interest attaches to the fact that, in the Wealden strata of England, there are to be found gigantic footsteps, arranged in order like those of the *Brontozoum*, and which there can be no reasonable doubt were made by some of the *Ornithoscelida*, the remains of which are found in the same rocks. And, knowing that reptiles that walked upon their hind legs and shared many of the anatomical characters of birds did once exist, it becomes a very important question whether the tracks in the Trias of Massachusetts, to which I referred some time ago, and which formerly used to be unhesitatingly ascribed to birds, may not all have been made by Ornithoscelidan reptiles; and whether, if we could obtain the skeletons of the animals which made these tracks, we should not find in them the actual steps of the evo-

lutional process by which reptiles gave rise to birds.

The evidential value of the facts I have brought forward in this Lecture must be neither over nor under estimated. It is not historical proof of the occurrence of the evolution of birds from reptiles, for we have no safe ground for assuming that true birds had not made their appearance at the commencement of the Mesozoic epoch. It is, in fact, quite possible that all these more or less avi-form reptiles of the Mesozoic epoch are not terms in the series of progression from birds to reptiles at all, but simply the more or less modified descendants of Palæozoic forms through which that transition was actually effected.

We are not in a position to say that the known *Ornithoscelida* are intermediate in the order of their appearance on the earth between reptiles and birds. All that can be said is that, if independent evidence of the actual occurrence of evolution is producible, then these intercalary forms remove every difficulty in the way of understanding what the actual steps of the process, in the case of birds, may have been.

That intercalary forms should have existed in ancient times is a necessary consequence of the truth of the hypothesis of evolution; and, hence, the evidence I have laid before you in proof of the existence of such forms, is, so far as it goes, in favour of that hypothesis.

There is another series of extinct reptiles which may be said to be intercalary between reptiles and birds, in so far as they combine some of the characters of both these groups; and which, as they possessed the power of flight, may seem, at first sight, to be nearer representatives of the forms by which the transition from the reptile to the bird was effected, than the *Ornithoscelida*.

These are the *Pterosauria*, or Pterodactyles, the remains of which are met with throughout the series of Mesozoic rocks, from the lias to the chalk, and some of which attained a great size, their wings having a span of eighteen or twenty feet. These animals, in the form and proportions of the head and neck relatively to the body, and in the fact that the ends of the jaws were often, if not always, more or less extensively ensheathed in horny beaks, remind us of birds. Moreover, their bones contained air cavities, rendering them specifically lighter, as is the case in most birds. The breast-bone was large and keeled, as in most birds and in bats, and the shoulder girdle is strikingly similar to that of ordinary birds. But, it seems to me, that the special resemblance of pterodactyles to birds ends here, unless I may add the entire absence of teeth which characterises the great pterodactyles (*Pteranodon*) discovered by Professor Marsh. All other known pterodactyles have teeth lodged in sockets. In the vertebral column and

the hind limbs there are no special resemblances to birds, and when we turn to the wings they are

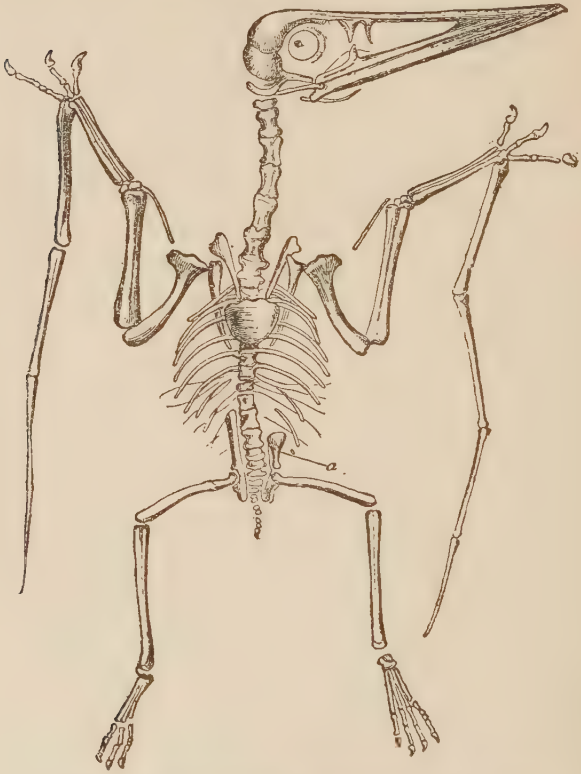

FIG. 8.—PTERODACTYLUS SPECTABILIS (Von Meyer).

found to be constructed on a totally different principle from those of birds.

There are four fingers. These four fingers are large, and three of them, those which answer to the thumb and two following fingers in my hand —are terminated by claws, while the fourth is enormously prolonged and converted into a great jointed style. You see at once, from what I have stated about a bird's wing, that there could be nothing less like a bird's wing than this is. It was concluded by general reasoning that this finger had the office of supporting a web which extended between it and the body. An existing specimen proves that such was really the case, and that the pterodactyles were devoid of feathers, but that the fingers supported a vast web like that of a bat's wing; in fact, there can be no doubt that this ancient reptile flew after the fashion of a bat.

Thus, though the pterodactyle is a reptile which has become modified in such a manner as to enable it to fly, and therefore, as might be expected, presents some points of resemblance to other animals which fly; it has, so to speak, gone off the line which leads directly from reptiles to birds, and has become disqualified for the changes which lead to the characteristic organisation of the latter class. Therefore, viewed in relation to the classes of reptiles and birds, the pterodactyles appear to me to be, in a limited sense, intercalary forms; but they are not even approximately linear, in the sense of exemplifying those modifications of structure through which the passage from the reptile to the bird took place.

LECTURES ON EVOLUTION

III

THE DEMONSTRATIVE EVIDENCE OF EVOLUTION

THE occurrence of historical facts is said to be demonstrated, when the evidence that they happened is of such a character as to render the assumption that they did not happen in the highest degree improbable; and the question I now have to deal with is, whether evidence in favour of the evolution of animals of this degree of cogency is, or is not, obtainable from the record of the succession of living forms which is presented to us by fossil remains.

Those who have attended to the progress of palæontology are aware that evidence of the character which I have defined has been produced in considerable and continually-increasing quantity during the last few years. Indeed, the amount and the satisfactory nature of that evidence are somewhat surprising, when we consider the conditions under which alone we can hope to obtain it.

It is obviously useless to seek for such evidence except in localities in which the physical conditions have been such as to permit of the deposit of an unbroken, or but rarely interrupted, series of strata through a long period of time; in which the group of animals to be investigated has existed in such abundance as to furnish the requisite supply of remains; and in which, finally, the materials composing the strata are such as to ensure the preservation of these remains in a tolerably perfect and undisturbed state.

It so happens that the case which, at present, most nearly fulfils all these conditions is that of the series of extinct animals which culminates in the horses; by which term I mean to denote not merely the domestic animals with which we are all so well acquainted, but their allies, the ass, zebra, quagga, and the like. In short, I use "horses" as the equivalent of the technical name *Equidæ*, which is applied to the whole group of existing equine animals.

The horse is in many ways a remarkable animal; not least so in the fact that it presents us with an example of one of the most perfect pieces of machinery in the living world. In truth, among the works of human ingenuity it cannot be said that there is any locomotive so perfectly adapted to its purposes, doing so much work with so small a quantity of fuel, as this machine of nature's manufacture—the horse. And, as a neces-

sary consequence of any sort of perfection, of mechanical perfection as of others, you find that the horse is a beautiful creature, one of the most beautiful of all land-animals. Look at the perfect balance of its form, and the rhythm and force of its action. The locomotive machinery is, as you are aware, resident in its slender fore and hind limbs; they are flexible and elastic levers, capable of being moved by very powerful muscles; and, in order to supply the engines which work these levers with the force which they expend, the horse is provided with a very perfect apparatus for grinding its food and extracting therefrom the requisite fuel.

Without attempting to take you very far into the region of osteological detail, I must nevertheless trouble you with some statements respecting the anatomical structure of the horse; and, more especially, will it be needful to obtain a general conception of the structure of its fore and hind limbs, and of its teeth. But I shall only touch upon those points which are absolutely essential to our inquiry.

Let us turn in the first place to the fore-limb. In most quadrupeds, as in ourselves, the fore-arm contains distinct bones called the radius and the ulna. The corresponding region in the horse seems at first to possess but one bone. Careful observation, however, enables us to distinguish in this bone a part which clearly answers to the upper

end of the ulna. This is closely united with the chief mass of the bone which represents the radius, and runs out into a slender shaft which may be traced for some distance downwards upon the back of the radius, and then in most cases thins out and vanishes. It takes still more trouble to make sure of what is nevertheless the fact, that a small part of the lower end of the bone of the horse's fore-arm, which is only distinct in a very young foal, is really the lower extremity of the ulna.

What is commonly called the knee of a horse is its wrist. The "cannon bone" answers to the middle bone of the five metacarpal bones, which support the palm of the hand in ourselves. The "pastern," "coronary," and "coffin" bones of veterinarians answer to the joints of our middle fingers, while the hoof is simply a greatly enlarged and thickened nail. But if what lies below the horse's "knee" thus corresponds to the middle finger in ourselves, what has become of the four other fingers or digits? We find in the places of the second and fourth digits only two slender splint-like bones, about two-thirds as long as the cannon bone, which gradually taper to their lower ends and bear no finger joints, or, as they are termed, phalanges. Sometimes, small bony or gristly nodules are to be found at the bases of these two metacarpal splints, and it is probable that these represent rudiments of the first and fifth toes. Thus, the part of the horse's skeleton, which

corresponds with that of the human hand, contains one overgrown middle digit, and at least two imperfect lateral digits; and these answer, respectively, to the third, the second, and the fourth fingers in man.

Corresponding modifications are found in the hind limb. In ourselves, and in most quadrupeds, the leg contains two distinct bones, a large bone, the tibia, and a smaller and more slender bone, the fibula. But, in the horse, the fibula seems, at first, to be reduced to its upper end; a short slender bone united with the tibia, and ending in a point below, occupying its place. Examination of the lower end of a young foal's shin-bone, however, shows a distinct portion of osseous matter, which is the lower end of the fibula; so that the, apparently single, lower end of the shin-bone is really made up of the coalesced ends of the tibia and fibula, just as the, apparently single, lower end of the fore-arm bone is composed of the coalesced radius and ulna.

The heel of the horse is the part commonly known as the hock. The hinder cannon bone answers to the middle metatarsal bone of the human foot, the pastern, coronary, and coffin bones, to the middle toe bones; the hind hoof to the nail; as in the fore-foot. And, as in the fore-foot, there are merely two splints to represent the second and the fourth toes. Sometimes a rudiment of a fifth toe appears to be traceable.

The teeth of a horse are not less peculiar than its limbs. The living engine, like all others, must be well stoked if it is to do its work; and the horse, if it is to make good its wear and tear, and to exert the enormous amount of force required for its propulsion, must be well and rapidly fed. To this end, good cutting instruments and powerful and lasting crushers are needful. Accordingly, the twelve cutting teeth of a horse are close-set and concentrated in the fore-part of its mouth, like so many adzes or chisels. The grinders or molars are large, and have an extremely complicated structure, being composed of a number of different substances of unequal hardness. The consequence of this is that they wear away at different rates; and, hence, the surface of each grinder is always as uneven as that of a good millstone.

I have said that the structure of the grinding teeth is very complicated, the harder and the softer parts being, as it were, interlaced with one another. The result of this is that, as the tooth wears, the crown presents a peculiar pattern, the nature of which is not very easily deciphered at first; but which it is important we should understand clearly. Each grinding tooth of the upper jaw has an *outer wall* so shaped that, on the worn crown, it exhibits the form of two crescents, one in front and one behind, with their concave sides turned outwards. From the inner side of the

front crescent, a crescentic *front ridge* passes inwards and backwards, and its inner face enlarges into a strong longitudinal fold or *pillar*. From the front part of the hinder crescent, a *back ridge* takes a like direction, and also has its *pillar*.

The deep interspaces or *valleys* between these ridges and the outer wall are filled by bony substance, which is called *cement*, and coats the whole tooth.

The pattern of the worn face of each grinding tooth of the lower jaw is quite different. It appears to be formed of two crescent-shaped ridges, the convexities of which are turned outwards. The free extremity of each crescent has a *pillar*, and there is a large double *pillar* where the two crescents meet. The whole structure is, as it were, imbedded in cement, which fills up the valleys, as in the upper grinders.

If the grinding faces of an upper and of a lower molar of the same side are applied together, it will be seen that the apposed ridges are nowhere parallel, but that they frequently cross; and that thus, in the act of mastication, a hard surface in the one is constantly applied to a soft surface in the other, and *vice versâ*. They thus constitute a grinding apparatus of great efficiency, and one which is repaired as fast as it wears, owing to the long-continued growth of the teeth.

Some other peculiarities of the dentition of the horse must be noticed, as they bear upon what I

shall have to say by and by. Thus the crowns of the cutting teeth have a peculiar deep pit, which gives rise to the well-known "mark" of the horse. There is a large space between the outer incisors and the front grinder. In this space the adult male horse presents, near the incisors on each side, above and below, a canine or "tush," which is commonly absent in mares. In a young horse, moreover, there is not unfrequently to be seen in front of the first grinder, a very small tooth, which soon falls out. If this small tooth be counted as one, it will be found that there are seven teeth behind the canine on each side; namely, the small tooth in question, and the six great grinders, among which, by an unusual peculiarity, the foremost tooth is rather larger than those which follow it.

I have now enumerated those characteristic structures of the horse which are of most importance for the purpose we have in view.

To any one who is acquainted with the morphology of vertebrated animals, they show that the horse deviates widely from the general structure of mammals; and that the horse type is, in many respects, an extreme modification of the general mammalian plan. The least modified mammals, in fact, have the radius and ulna, the tibia and fibula, distinct and separate. They have five distinct and complete digits on each foot, and no one of these digits is very much

larger than the rest. Moreover, in the least modified mammals, the total number of the teeth is very generally forty-four, while in horses, the usual number is forty, and in the absence of the canines, it may be reduced to thirty-six; the incisor teeth are devoid of the fold seen in those of the horse: the grinders regularly diminish in size from the middle of the series to its front end; while their crowns are short, early attain their full length, and exhibit simple ridges or tubercles, in place of the complex foldings of the horse's grinders.

Hence the general principles of the hypothesis of evolution lead to the conclusion that the horse must have been derived from some quadruped which possessed five complete digits on each foot; which had the bones of the fore-arm and of the leg complete and separate; and which possessed forty-four teeth, among which the crowns of the incisors and grinders had a simple structure; while the latter gradually increased in size from before backwards, at any rate in the anterior part of the series, and had short crowns.

And if the horse has been thus evolved, and the remains of the different stages of its evolution have been preserved, they ought to present us with a series of forms in which the number of the digits becomes reduced; the bones of the fore-arm and leg gradually take on the equine condition; and the form and arrangement of the teeth

successively approximate to those which obtain in existing horses.

Let us turn to the facts, and see how far they fulfil these requirements of the doctrine of evolution.

In Europe abundant remains of horses are found in the Quaternary and later Tertiary strata as far as the Pliocene formation. But these horses, which are so common in the cave-deposits and in the gravels of Europe, are in all essential respects like existing horses. And that is true of all the horses of the latter part of the Pliocene epoch. But, in deposits which belong to the earlier Pliocene and later Miocene epochs, and which occur in Britain, in France, in Germany, in Greece, in India, we find animals which are extremely like horses—which, in fact, are so similar to horses, that you may follow descriptions given in works upon the anatomy of the horse upon the skeletons of these animals—but which differ in some important particulars. For example, the structure of their fore and hind limbs is somewhat different. The bones which, in the horse, are represented by two splints, imperfect below, are as long as the middle metacarpal and metatarsal bones; and, attached to the extremity of each, is a digit with three joints of the same general character as those of the middle digit, only very much smaller. These small digits are so disposed that they could have had but very

little functional importance, and they must have been rather of the nature of the dew-claws, such as are to be found in many ruminant animals. The *Hipparion*, as the extinct European three-toed horse is called, in fact, presents a foot similar to that of the American *Protohippus* (Fig. 9), except that, in the *Hipparion*, the smaller digits are situated farther back, and are of smaller proportional size, than in the *Protohippus*.

The ulna is slightly more distinct than in the horse; and the whole length of it, as a very slender shaft, intimately united with the radius, is completely traceable. The fibula appears to be in the same condition as in the horse. The teeth of the *Hipparion* are essentially similar to those of the horse, but the pattern of the grinders is in some respects a little more complex, and there is a depression on the face of the skull in front of the orbit, which is not seen in existing horses.

In the earlier Miocene, and perhaps the later Eocene deposits of some parts of Europe, another extinct animal has been discovered, which Cuvier, who first described some fragments of it, considered to be a *Palæotherium*. But as further discoveries threw new light upon its structure, it was recognised as a distinct genus, under the name of *Anchitherium*.

In its general characters, the skeleton of *Anchitherium* is very similar to that of the horse. In

fact, Lartet and De Blainville called it *Palæotherium equinum* or *hippoides;* and De Christol, in 1847, said that it differed from *Hipparion* in little more than the characters of its teeth, and gave it the name of *Hipparitherium.* Each foot possesses three complete toes; while the lateral toes are much larger in proportion to the middle toe than in *Hipparion,* and doubtless rested on the ground in ordinary locomotion.

The ulna is complete and quite distinct from the radius, though firmly united with the latter. The fibula seems also to have been complete. Its lower end, though intimately united with that of the tibia, is clearly marked off from the latter bone.

There are forty-four teeth. The incisors have no strong pit. The canines seem to have been well developed in both sexes. The first of the seven grinders, which, as I have said, is frequently absent, and, when it does exist, is small in the horse, is a good-sized and permanent tooth, while the grinder which follows it is but little larger than the hinder ones. The crowns of the grinders are short, and though the fundamental pattern of the horse-tooth is discernible, the front and back ridges are less curved, the accessory pillars are wanting, and the valleys, much shallower, are not filled up with cement.

Seven years ago, when I happened to be looking critically into the bearing of palæontological facts

upon the doctrine of evolution, it appeared to me that the *Anchitherium*, the *Hipparion*, and the modern horses, constitute a series in which the modifications of structure coincide with the order of chronological occurrence, in the manner in which they must coincide, if the modern horses really are the result of the gradual metamorphosis, in the course of the Tertiary epoch, of a less specialised ancestral form. And I found by correspondence with the late eminent French anatomist and palæontologist, M. Lartet, that he had arrived at the same conclusion from the same data.

That the *Anchitherium* type had become metamorphosed into the *Hipparion* type, and the latter into the *Equine* type, in the course of that period of time which is represented by the latter half of the Tertiary deposits, seemed to me to be the only explanation of the facts for which there was even a shadow of probability.[1]

And, hence, I have ever since held that these facts afford evidence of the occurrence of evolution, which, in the sense already defined, may be termed demonstrative.

[1] I use the word "type" because it is highly probable that many forms of *Anchitherium*-like and *Hipparion*-like animals existed in the Miocene and Pliocene epochs, just as many species of the horse tribe exist now; and it is highly improbable that the particular species of *Anchitherium* or *Hipparion*, which happen to have been discovered, should be precisely those which have formed part of the direct line of the horse's pedigree.

All who have occupied themselves with the structure of *Anchitherium*, from Cuvier onwards, have acknowledged its many points of likeness to a well-known genus of extinct Eocene mammals, *Palæotherium*. Indeed, as we have seen, Cuvier regarded his remains of *Anchitherium* as those of a species of *Palæotherium*. Hence, in attempting to trace the pedigree of the horse beyond the Miocene epoch and the Anchitheroid form, I naturally sought among the various species of Palæotheroid animals for its nearest ally, and I was led to conclude that the *Palæotherium minus* (*Plagiolophus*) represented the next step more nearly than any form then known.

I think that this opinion was fully justifiable; but the progress of investigation has thrown an unexpected light on the question, and has brought us much nearer than could have been anticipated to a knowledge of the true series of the progenitors of the horse.

You are all aware that, when your country was first discovered by Europeans, there were no traces of the existence of the horse in any part of the American Continent. The accounts of the conquest of Mexico dwell upon the astonishment of the natives of that country when they first became acquainted with that astounding phenomenon—a man seated upon a horse. Nevertheless, the investigations of American geologists have proved that the remains of horses occur in

the most superficial deposits of both North and South America, just as they do in Europe. Therefore, for some reason or other—no feasible suggestion on that subject, so far as I know, has been made—the horse must have died out on this continent at some period preceding the discovery of America. Of late years there has been discovered in your Western Territories that marvellous accumulation of deposits, admirably adapted for the preservation of organic remains, to which I referred the other evening, and which furnishes us with a consecutive series of records of the fauna of the older half of the Tertiary epoch, for which we have no parallel in Europe. They have yielded fossils in an excellent state of conservation and in unexampled number and variety. The researches of Leidy and others have shown that forms allied to the *Hipparion* and the *Anchitherium* are to be found among these remains. But it is only recently that the admirably conceived and most thoroughly and patiently worked-out investigations of Professor Marsh have given us a just idea of the vast fossil wealth, and of the scientific importance, of these deposits. I have had the advantage of glancing over the collections in Yale Museum; and I can truly say that, so far as my knowledge extends, there is no collection from any one region and series of strata comparable, for extent, or for the care with which the remains have been got to-

gether, or for their scientific importance, to the series of fossils which he has deposited there. This vast collection has yielded evidence bearing upon the question of the pedigree of the horse of the most striking character. It tends to show that we must look to America, rather than to Europe, for the original seat of the equine series; and that the archaic forms and successive modifications of the horse's ancestry are far better preserved here than in Europe.

Professor Marsh's kindness has enabled me to put before you a diagram, every figure in which is an actual representation of some specimen which is to be seen at Yale at this present time (Fig. 9).

The succession of forms which he has brought together carries us from the top to the bottom of the Tertiaries. Firstly, there is the true horse. Next we have the American Pliocene form of the horse (*Pliohippus*); in the conformation of its limbs it presents some very slight deviations from the ordinary horse, and the crowns of the grinding teeth are shorter. Then comes the *Protohippus*, which represents the European *Hipparion*, having one large digit and two small ones on each foot, and the general characters of the fore-arm and leg to which I have referred. But it is more valuable than the European *Hipparion* for the reason that it is devoid of some of the peculiarities of that form—peculiarities which tend to show that the

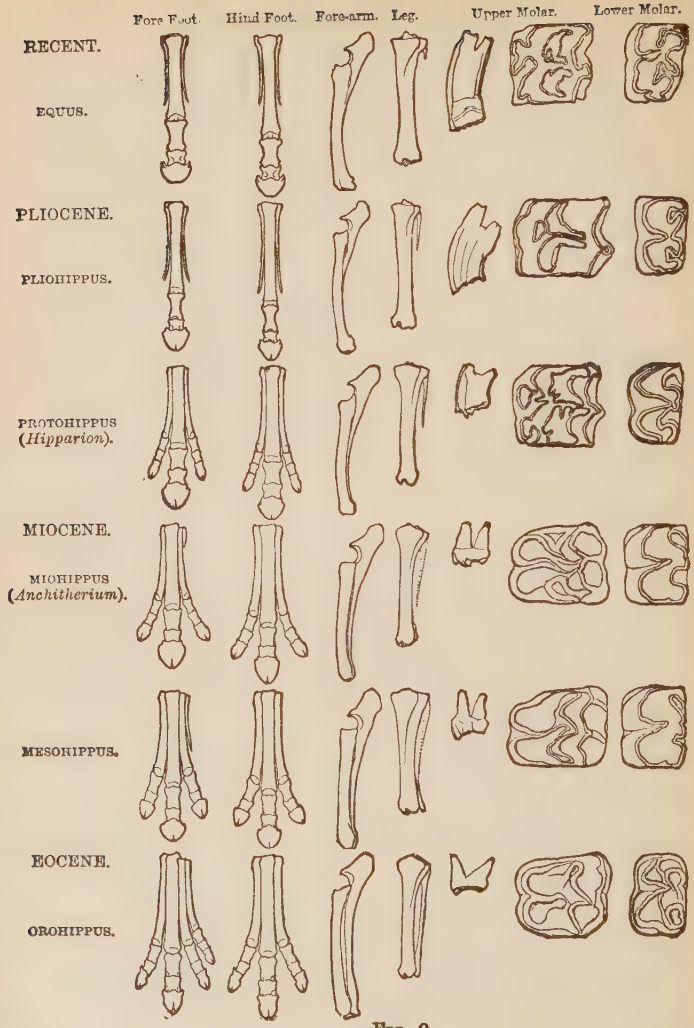
Fore Foot.
Hind Foot.
Fore-arm.
Leg.
Upper Molar.
Lower Molar.
RECENT.
EQUUS.
PLIOCENE.
PLIOHIPPUS.
PROTOHIPPUS
(Hipparion).
MIOCENE.
MIOHIPPUS
(Anchitherium).
MESOHIPPUS.
EOCENE.
OROHIPPUS.

FIG. 9.

European *Hipparion* is rather a member of a collateral branch, than a form in the direct line of succession. Next, in the backward order in time, is the *Miohippus*, which corresponds pretty nearly with the *Anchitherium* of Europe. It presents three complete toes—one large median and two smaller lateral ones; and there is a rudiment of that digit, which answers to the little finger of the human hand.

The European record of the pedigree of the horse stops here; in the American Tertiaries, on the contrary, the series of ancestral equine forms is continued into the Eocene formations. An older Miocene form, termed *Mesohippus*, has three toes in front, with a large splint-like rudiment representing the little finger; and three toes behind. The radius and ulna, the tibia and the fibula, are distinct, and the short crowned molar teeth are anchitherioid in pattern.

But the most important discovery of all is the *Orohippus*, which comes from the Eocene formation, and is the oldest member of the equine series, as yet known. Here we find four complete toes on the front limb, three toes on the hind-limb, a well-developed ulna, a well-developed fibula, and short-crowned grinders of simple pattern.

Thus, thanks to these important researches, it has become evident that, so far as our present knowledge extends, the history of the horse-type is exactly and precisely that which could have been

predicted from a knowledge of the principles of evolution. And the knowledge we now possess justifies us completely in the anticipation, that when the still lower Eocene deposits, and those which belong to the Cretaceous epoch, have yielded up their remains of ancestral equine animals, we shall find, first, a form with four complete toes and a rudiment of the innermost or first digit in front, with, probably, a rudiment of the fifth digit in the hind foot;[1] while, in still older forms, the series of the digits will be more and more complete, until we come to the five-toed animals, in which, if the doctrine of evolution is well founded, the whole series must have taken its origin.

That is what I mean by demonstrative evidence of evolution. An inductive hypothesis is said to be demonstrated when the facts are shown to be in entire accordance with it. If that is not scientific proof, there are no merely inductive conclusions which can be said to be proved. And the doctrine of evolution, at the present time, rests upon exactly as secure a foundation as the Copernican theory of the motions of the heavenly bodies did at the time of its promulgation. Its logical basis is precisely of the

[1] Since this lecture was delivered, Professor Marsh has discovered a new genus of equine mammals (*Eohippus*) from the lowest Eocene deposits of the West, which corresponds very nearly to this description.—*American Journal of Science*, November, 1876.

same character—the coincidence of the observed facts with theoretical requirements.

The only way of escape, if it be a way of escape, from the conclusions which I have just indicated, is the supposition that all these different equine forms have been created separately at separate epochs of time; and, I repeat, that of such an hypothesis as this there neither is, nor can be, any scientific evidence; and, assuredly, so far as I know, there is none which is supported, or pretends to be supported, by evidence or authority of any other kind. I can but think that the time will come when such suggestions as these, such obvious attempts to escape the force of demonstration, will be put upon the same footing as the supposition made by some writers, who are I believe not completely extinct at present, that fossils are mere simulacra, are no indications of the former existence of the animals to which they seem to belong; but that they are either sports of Nature, or special creations, intended—as I heard suggested the other day—to test our faith.

In fact, the whole evidence is in favour of evolution, and there is none against it. And I say this, although perfectly well aware of the seeming difficulties which have been built up upon what appears to the uninformed to be a solid foundation. I meet constantly with the argument that the doctrine of evolution cannot be well founded, because it requires the lapse of a very

vast period of time; while the duration of life upon the earth thus implied is inconsistent with the conclusions arrived at by the astronomer and the physicist. I may venture to say that I am familiar with those conclusions, inasmuch as some years ago, when President of the Geological Society of London, I took the liberty of criticising them, and of showing in what respects, as it appeared to me, they lacked complete and thorough demonstration. But, putting that point aside, suppose that, as the astronomers, or some of them, and some physical philosophers, tell us, it is impossible that life could have endured upon the earth for as long a period as is required by the doctrine of evolution—supposing that to be proved—I desire to be informed, what is the foundation for the statement that evolution does require so great a time? The biologist knows nothing whatever of the amount of time which may be required for the process of evolution. It is a matter of fact that the equine forms which I have described to you occur, in the order stated, in the Tertiary formations. But I have not the slightest means of guessing whether it took a million of years, or ten millions, or a hundred millions, or a thousand millions of years, to give rise to that series of changes. A biologist has no means of arriving at any conclusion as to the amount of time which may be needed for a certain quantity of organic change He takes

his time from the geologist. The geologist, considering the rate at which deposits are formed and the rate at which denudation goes on upon the surface of the earth, arrives at more or less justifiable conclusions as to the time which is required for the deposit of a certain thickness of rocks; and if he tells me that the Tertiary formations required 500,000,000 years for their deposit, I suppose he has good ground for what he says, and I take that as a measure of the duration of the evolution of the horse from the *Orohippus* up to its present condition. And, if he is right, undoubtedly evolution is a very slow process, and requires a great deal of time. But suppose, now, that an astronomer or a physicist—for instance, my friend Sir William Thomson—tells me that my geological authority is quite wrong; and that he has weighty evidence to show that life could not possibly have existed upon the surface of the earth 500,000,000 years ago, because the earth would have then been too hot to allow of life, my reply is: "That is not my affair; settle that with the geologist, and when you have come to an agreement among yourselves I will adopt your conclusion." We take our time from the geologists and physicists; and it is monstrous that, having taken our time from the physical philosopher's clock, the physical philosopher should turn round upon us, and say we are too fast or too slow. What we

desire to know is, is it a fact that evolution took place? As to the amount of time which evolution may have occupied, we are in the hands of the physicist and the astronomer, whose business it is to deal with those questions.

I have now, ladies and gentlemen, arrived at the conclusion of the task which I set before myself when I undertook to deliver these lectures. My purpose has been, not to enable those among you who have paid no attention to these subjects before, to leave this room in a condition to decide upon the validity or the invalidity of the hypothesis of evolution; but I have desired to put before you the principles upon which all hypotheses respecting the history of Nature must be judged; and furthermore, to make apparent the nature of the evidence and the amount of cogency which is to be expected and may be obtained from it. To this end, I have not hesitated to regard you as genuine students and persons desirous of knowing the truth. I have not shrunk from taking you through long discussions, that I fear may have sometimes tried your patience; and I have inflicted upon you details which were indispensable, but which may well have been wearisome. But I shall rejoice—I shall consider that I have done you the greatest service which it was in my power to do—if I have thus convinced you that the great question which

we have been discussing is not one to be dealt with by rhetorical flourishes, or by loose and superficial talk; but that it requires the keen attention of the trained intellect and the patience of the accurate observer.

When I commenced this series of lectures, I did not think it necessary to preface them with a prologue, such as might be expected from a stranger and a foreigner; for during my brief stay in your country, I have found it very hard to believe that a stranger could be possessed of so many friends, and almost harder that a foreigner could express himself in your language in such a way as to be, to all appearance, so readily intelligible. So far as I can judge, that most intelligent, and perhaps, I may add, most singularly active and enterprising body, your press reporters, do not seem to have been deterred by my accent from giving the fullest account of everything that I happen to have said.

But the vessel in which I take my departure to-morrow morning is even now ready to slip her moorings; I awake from my delusion that I am other than a stranger and a foreigner. I am ready to go back to my place and country; but, before doing so, let me, by way of epilogue, tender to you my most hearty thanks for the kind and cordial reception which you have accorded to me; and let me thank you still more

for that which is the greatest compliment which can be afforded to any person in my position—the continuous and undisturbed attention which you have bestowed upon the long argument which I have had the honour to lay before you.

IV

THE INTERPRETERS OF GENESIS AND THE INTERPRETERS OF NATURE

[1885]

Our fabulist warns "those who in quarrels interpose" of the fate which is probably in store for them; and, in venturing to place myself between so powerful a controversialist as Mr. Gladstone and the eminent divine whom he assaults with such vigour in the last number of this Review,[1] I am fully aware that I run great danger of verifying Gay's prediction. Moreover, it is quite possible that my zeal in offering aid to a combatant so extremely well able to take care of himself as M. Réville may be thought to savour of indiscretion.

Two considerations, however, have led me to face the double risk. The one is that though, in my judgment, M. Réville is wholly in the right in that part of the controversy to which I propose to restrict my observations, nevertheless he, as a

[1] *The Nineteenth Century.*

foreigner, has very little chance of making the truth prevail with Englishmen against the authority and the dialectic skill of the greatest master of persuasive rhetoric among English-speaking men of our time. As the Queen's proctor intervenes, in certain cases, between two litigants in the interests of justice, so it may be permitted me to interpose as a sort of uncommissioned science proctor. My second excuse for my meddlesomeness is, that important questions of natural science—respecting which neither of the combatants professes to speak as an expert—are involved in the controversy; and I think it is desirable that the public should know what it is that natural science really has to say on these topics, to the best belief of one who has been a diligent student of natural science for the last forty years.

The original "Prolégomènes de l'Histoire des Religions" has not come in my way; but I have read the translation of M. Réville's work, published in England under the auspices of Professor Max Müller, with very great interest. It puts more fairly and clearly than any book previously known to me, the view which a man of strong religious feelings, but at the same time possessing the information and the reasoning power which enable him to estimate the strength of scientific methods of inquiry and the weight of scientific truth, may be expected to take of the relation between science and religion.

In the chapter on "The Primitive Revelation" the scientific worth of the account of the Creation given in the book of Genesis is estimated in terms which are as unquestionably respectful as, in my judgment, they are just; and, at the end of the chapter on "Primitive Tradition," M. Réville appraises the value of pentateuchal anthropology in a way which I should have thought sure of enlisting the assent of all competent judges, even if it were extended to the whole of the cosmogony and biology of Genesis:—

> As, however, the original traditions of nations sprang up in an epoch less remote than our own from the primitive life, it is indispensable to consult them, to compare them, and to associate them with other sources of information which are available. From this point of view, the traditions recorded in Genesis possess, in addition to their own peculiar charm, a value of the highest order; but we cannot ultimately see in them more than a venerable fragment, well-deserving attention, of the great genesis of mankind.

Mr. Gladstone is of a different mind. He dissents from M. Réville's views respecting the proper estimation of the pentateuchal traditions, no less than he does from his interpretation of those Homeric myths which have been the object of his own special study. In the latter case, Mr. Gladstone tells M. Réville that he is wrong on his own authority, to which, in such a matter, all will pay due respect: in the former, he affirms himself to be "wholly destitute of that kind of knowledge which carries authority," and his rebuke is

administered in the name and by the authority of natural science.

An air of magisterial gravity hangs about the following passage :—

> But the question is not here of a lofty poem, or a skilfully constructed narrative : it is whether natural science, in the patient exercise of its high calling to examine facts, finds that the works of God cry out against what we have fondly believed to be His word and tell another tale ; or whether, in this nineteenth century of Christian progress, it substantially echoes back the majestic sound, which, before it existed as a pursuit, went forth into all lands.
>
> First, looking largely at the latter portion of the narrative, which describes the creation of living organisms, and waiving details, on some of which (as in v. 24) the Septuagint seems to vary from the Hebrew, there is a grand fourfold division, set forth in an orderly succession of times as follows : on the fifth day
>
> 1. The water-population ;
> 2. The air-population ;
>
> and, on the sixth day,
>
> 3. The land-population of animals ;
> 4. The land-population consummated in man.
>
> Now this same fourfold order is understood to have been so affirmed in our time by natural science, that it may be taken as a demonstrated conclusion and established fact (p. 696).

"Understood?" By whom? I cannot bring myself to imagine that Mr. Gladstone has made so solemn and authoritative a statement on a matter of this importance without due inquiry—without being able to found himself upon recognised scientific authority. But I wish he had thought fit to name the source from whence he has derived his information, as, in that case, I could have dealt with

his authority, and I should have thereby escaped the appearance of making an attack on Mr. Gladstone himself, which is in every way distasteful to me.

For I can meet the statement in the last paragraph of the above citation with nothing but a direct negative. If I know anything at all about the results attained by the natural science of our time, it is "a demonstrated conclusion and established fact" that the "fourfold order" given by Mr. Gladstone is not that in which the evidence at our disposal tends to show that the water, air, and land-populations of the globe have made their appearance.

Perhaps I may be told that Mr. Gladstone does give his authority—that he cites Cuvier, Sir John Herschel, and Dr. Whewell in support of his case. If that has been Mr. Gladstone's intention in mentioning these eminent names, I may remark that, on this particular question, the only relevant authority is that of Cuvier. But great as Cuvier was, it is to be remembered that, as Mr. Gladstone incidentally remarks, he cannot now be called a recent authority. In fact, he has been dead more than half a century; and the palæontology of our day is related to that of his, very much as the geography of the sixteenth century is related to that of the fourteenth. Since 1832, when Cuvier died, not only a new world, but new worlds, of ancient life have been discovered; and those who

have most faithfully carried on the work of the chief founder of palæontology have done most to invalidate the essentially negative grounds of his speculative adherence to tradition.

If Mr. Gladstone's latest information on these matters is derived from the famous discourse prefixed to the "Ossemens Fossiles," I can understand the position he has taken up; if he has ever opened a respectable modern manual of palæontology, or geology, I cannot. For the facts which demolish his whole argument are of the commonest notoriety. But before proceeding to consider the evidence for this assertion we must be clear about the meaning of the phraseology employed.

I apprehend that when Mr. Gladstone uses the term "water-population" he means those animals which in Genesis i. 21 (Revised Version) are spoken of as "the great sea monsters and every living creature that moveth, which the waters brought forth abundantly, after their kind." And I presume that it will be agreed that whales and porpoises, sea fishes, and the innumerable hosts of marine invertebrated animals, are meant thereby. So "air-population" must be the equivalent of "fowl" in verse 20, and "every winged fowl after its kind," verse 21. I suppose I may take it for granted that by "fowl" we have here to understand birds—at any rate primarily. Secondarily, it may be that the bats and the extinct pterodactyles, which were flying reptiles, come under the same head. But

whether all insects are "creeping things" of the land-population, or whether flying insects are to be included under the denomination of "winged fowl," is a point for the decision of Hebrew exegetes. Lastly, I suppose I may assume that "land-population" signifies "the cattle" and "the beasts of the earth," and "every creeping thing that creepeth upon the earth," in verses 25 and 26; presumably it comprehends all kinds of terrestrial animals, vertebrate and invertebrate, except such as may be comprised under the head of the "air-population."

Now what I want to make clear is this: that if the terms "water-population," "air-population," and "land-population" are understood in the senses here defined, natural science has nothing to say in favour of the proposition that they succeeded one another in the order given by Mr. Gladstone; but that, on the contrary, all the evidence we possess goes to prove that they did not. Whence it will follow that, if Mr. Gladstone has interpreted Genesis rightly (on which point I am most anxious to be understood to offer no opinion), that interpretation is wholly irreconcilable with the conclusions at present accepted by the interpreters of nature—with everything that can be called "a demonstrated conclusion and established fact" of natural science. And be it observed that I am not here dealing with a question of speculation, but with a question of fact.

Either the geological record is sufficiently complete to afford us a means of determining the order in which animals have made their appearance on the globe or it is not. If it is, the determination of that order is little more than a mere matter of observation; if it is not, then natural science neither affirms nor refutes the "fourfold order," but is simply silent.

The series of the fossiliferous deposits, which contain the remains of the animals which have lived on the earth in past ages of its history, and which can alone afford the evidence required by natural science of the order of appearance of their different species, may be grouped in the manner shown in the left-hand column of the following table, the oldest being at the bottom :—

Formations	First known appearance of
Quaternary.	
Pliocene.	
Miocene.	
Eocene . .	Vertebrate *air*-population (Bats).
Cretaceous.	
Jurassic . .	Vertebrate *air*-population (Birds and Pterodactyles).
Triassic.	
Upper Palæozoic.	
Middle Palæozoic .	Vertebrate *land*-population (Amphibia, Reptilia [?]).
Lower Palæozoic.	
Silurian . .	Vertebrate *water*-population (Fishes). Invertebrate *air* and *land*-population (Flying Insects and Scorpions).
Cambrian .	Invertebrate *water*-population (much earlier, if *Eozoon* is animal).

In the right-hand column I have noted the group of strata in which, according to our present information, the *land*, *air*, and *water*-populations respectively appear for the first time; and in consequence of the ambiguity about the meaning of "fowl," I have separately indicated the first appearance of bats, birds, flying reptiles, and flying insects. It will be observed that, if "fowl" means only "bird," or at most flying vertebrate, then the first certain evidence of the latter, in the Jurassic epoch, is posterior to the first appearance of truly terrestrial *Amphibia*, and possibly of true reptiles, in the Carboniferous epoch (Middle Palæozoic) by a prodigious interval of time.

The water-population of vertebrated animals first appears in the Upper Silurian.[1] Therefore, if we found ourselves on vertebrated animals and take "fowl" to mean birds only, or, at most, flying vertebrates, natural science says that the order of succession was water, land, and air-population, and not—as Mr. Gladstone, founding himself on Genesis, says—water, air, land-population. If a chronicler of Greece affirmed that the age of Alexander preceded that of Pericles and immediately succeeded that of the Trojan war, Mr. Gladstone would hardly say that this order is "understood to have been so affirmed by historical science that it may be taken as a demonstrated conclusion and established fact." Yet natural science "affirms" his "fourfold order"

[1] Earlier, if more recent announcements are correct.]

to exactly the same extent—neither more nor less.

Suppose, however, that "fowl" is to be taken to include flying insects. In that case, the first appearance of an air-population must be shifted back for long ages, recent discovery having shown that they occur in rocks of Silurian age. Hence there might still have been hope for the fourfold order, were it not that the fates unkindly determined that scorpions — "creeping things that creep on the earth" *par excellence*—turned up in Silurian strata nearly at the same time. So that, if the word in the original Hebrew translated "fowl" should really after all mean "cockroach" —and I have great faith in the elasticity of that tongue in the hands of Biblical exegetes—the order primarily suggested by the existing evidence—

2. Land and air-population;
1. Water-population;

and Mr. Gladstone's order—

3. Land-population;
2. Air-population;
1. Water-population;

can by no means be made to coincide. As a matter of fact, then, the statement so confidently put forward turns out to be devoid of foundation and in direct contradiction of the evidence at present at our disposal.[1]

[1] It may be objected that I have not put the case fairly, inasmuch as the solitary insect's wing which was discovered

If, stepping beyond that which may be learned from the facts of the successive appearance of the forms of animal life upon the surface of the globe, in so far as they are yet made known to us by natural science, we apply our reasoning faculties to the task of finding out what those observed facts mean, the present conclusions of the interpreters of nature appear to be no less directly in conflict with those of the latest interpreter of Genesis.

Mr. Gladstone appears to admit that there is some truth in the doctrine of evolution, and indeed places it under very high patronage.

> I contend that evolution in its highest form has not been a thing heretofore unknown to history, to philosophy, or to theology. I contend that it was before the mind of Saint Paul when he taught that in the fulness of time God sent forth His Son, and of Eusebius when he wrote the "Preparation for the Gospel," and of Augustine when he composed the "City of God" (p. 706).

---

twelve months ago in Silurian rocks, and which is, at present, the sole evidence of insects older than the Devonian epoch, came from strata of Middle Silurian age, and is therefore older than the scorpions which, within the last two years, have been found in Upper Silurian strata in Sweden, Britain, and the United States. But no one who comprehends the nature of the evidence afforded by fossil remains would venture to say that the non-discovery of scorpions in the Middle Silurian strata, up to this time, affords any more ground for supposing that they did not exist, than the non-discovery of flying insects in the Upper Silurian strata, up to this time, throws any doubt on the certainty that they existed, which is derived from the occurrence of the wing in the Middle Silurian. In fact, I have stretched a point in admitting that these fossils afford a colourable pretext for the assumption that the land and air-population were of contemporaneous origin.

Has any one ever disputed the contention, thus solemnly enunciated, that the doctrine of evolution was not invented the day before yesterday? Has any one ever dreamed of claiming it as a modern innovation? Is there any one so ignorant of the history of philosophy as to be unaware that it is one of the forms in which speculation embodied itself long before the time either of the Bishop of Hippo or of the Apostle to the Gentiles? Is Mr. Gladstone, of all people in the world, disposed to ignore the founders of Greek philosophy, to say nothing of Indian sages to whom evolution was a familiar notion ages before Paul of Tarsus was born? But it is ungrateful to cavil at even the most oblique admission of the possible value of one of those affirmations of natural science which really may be said to be "a demonstrated conclusion and established fact." I note it with pleasure, if only for the purpose of introducing the observation that, if there is any truth whatever in the doctrine of evolution as applied to animals, Mr. Gladstone's gloss on Genesis in the following passage is hardly happy:—

> God created
> (*a*) The water-population;
> (*b*) The air-population.
> And they receive His benediction (v. 20–23).
>
> 6. Pursuing this regular progression from the lower to the higher, from the simple to the complex, the text now gives us the work of the sixth "day," which supplies the land-population, air and water having been already supplied (pp. 695, 696).

The gloss to which I refer is the assumption that the "air-population" forms a term in the order of progression from lower to higher, from simple to complex—the place of which lies between the water-population below and the land-population above—and I speak of it as a "gloss," because the pentateuchal writer is nowise responsible for it.

But it is not true that the air-population, as a whole, is "lower" or less "complex" than the land-population. On the contrary, every beginner in the study of animal morphology is aware that the organisation of a bat, of a bird, or of a pterodactyle presupposes that of a terrestrial quadruped; and that it is intelligible only as an extreme modification of the organisation of a terrestrial mammal or reptile. In the same way winged insects (if they are to be counted among the "air-population") presuppose insects which were wingless, and, therefore, as "creeping things," were part of the land-population. Thus theory is as much opposed as observation to the admission that natural science endorses the succession of animal life which Mr. Gladstone finds in Genesis. On the contrary, a good many representatives of natural science would be prepared to say, on theoretical grounds alone, that it is incredible that the "air-population" should have appeared before the "land-population"—and that, if this assertion is to be found in Genesis, it merely

demonstrates the scientific worthlessness of the story of which it forms a part.

Indeed, we may go further. It is not even admissible to say that the water-population, as a whole, appeared before the air and the land-populations. According to the Authorised Version, Genesis especially mentions, among the animals created on the fifth day, "great whales," in place of which the Revised Version reads "great sea monsters." Far be it from me to give an opinion which rendering is right, or whether either is right. All I desire to remark is, that if whales and porpoises, dugongs and manatees, are to be regarded as members of the water-population (and if they are not, what animals can claim the designation ?), then that much of the water-population has, as certainly, originated later than the land-population as bats and birds have. For I am not aware that any competent judge would hesitate to admit that the organisation of these animals shows the most obvious signs of their descent from terrestrial quadrupeds.

A similar criticism applies to Mr. Gladstone's assumption that, as the fourth act of that "orderly succession of times" enunciated in Genesis, "the land-population consummated in man."

If this means simply that man is the final term in the evolutional series of which he forms a part, I do not suppose that any objection will be raised to that statement on the part of students of

natural science. But if the pentateuchal author goes further than this, and intends to say that which is ascribed to him by Mr. Gladstone, I think natural science will have to enter a *caveat.* It is not by any means certain that man—I mean the species *Homo sapiens* of zoological terminology —has "consummated" the land-population in the sense of appearing at a later period of time than any other. Let me make my meaning clear by an example. From a morphological point of view, our beautiful and useful contemporary—I might almost call him colleague—the horse (*Equus caballus*), is the last term of the evolutional series to which he belongs, just as *Homo sapiens* is the last term of the series of which he is a member. If I want to know whether the species *Equus caballus* made its appearance on the surface of the globe before or after *Homo sapiens,* deduction from known laws does not help me. There is no reason, that I know of, why one should have appeared sooner or later than the other. If I turn to observation, I find abundant remains of *Equus caballus* in Quaternary strata, perhaps a little earlier. The existence of *Homo sapiens* in the Quaternary epoch is also certain. Evidence has been adduced in favour of man's existence in the Pliocene, or even in the Miocene epoch. It does not satisfy me; but I have no reason to doubt that the fact may be so, nevertheless. Indeed, I think it is quite possible that further

research will show that *Homo sapiens* existed, not only before *Equus caballus*, but before many other of the existing forms of animal life; so that, if all the species of animals have been separately created, man, in this case, would by no means be the "consummation" of the land-population.

I am raising no objection to the position of the fourth term in Mr. Gladstone's "order"—on the facts, as they stand, it is quite open to any one to hold, as a pious opinion, that the fabrication of man was the acme and final achievement of the process of peopling the globe. But it must not be said that natural science counts this opinion among her "demonstrated conclusions and established facts," for there would be just as much, or as little, reason for ranging the contrary opinion among them.

It may seem superfluous to add to the evidence that Mr. Gladstone has been utterly misled in supposing that his interpretation of Genesis receives any support from natural science. But it is as well to do one's work thoroughly while one is about it; and I think it may be advisable to point out that the facts, as they are at present known, not only refute Mr. Gladstone's interpretation of Genesis in detail, but are opposed to the central idea on which it appears to be based.

There must be some position from which the reconcilers of science and Genesis will not retreat, some central idea the maintenance of which is vital and its refutation fatal. Even if they now allow

that the words "the evening and the morning" have not the least reference to a natural day, but mean a period of any number of millions of years that may be necessary; even if they are driven to admit that the word "creation," which so many millions of pious Jews and Christians have held, and still hold, to mean a sudden act of the Deity, signifies a process of gradual evolution of one species from another, extending through immeasurable time; even if they are willing to grant that the asserted coincidence of the order of Nature with the "fourfold order" ascribed to Genesis is an obvious error instead of an established truth; they are surely prepared to make a last stand upon the conception which underlies the whole, and which constitutes the essence of Mr. Gladstone's "fourfold division, set forth in an orderly succession of times." It is, that the animal species which compose the water-population, the air-population, and the land-population respectively, originated during three distinct and successive periods of time, and only during those periods of time.

This statement appears to me to be the interpretation of Genesis which Mr. Gladstone supports, reduced to its simplest expression. "Period of time" is substituted for "day"; "originated" is substituted for "created"; and "any order required" for that adopted by Mr. Gladstone. It is necessary to make this proviso, for if "day" may mean a few million years, and "creation" may

mean evolution, then it is obvious that the order (1) water-population, (2) air-population, (3) land-population, may also mean (1) water-population, (2) land-population, (3) air-population; and it would be unkind to bind down the reconcilers to this detail when one has parted with so many others to oblige them.

But even this sublimated essence of the pentateuchal doctrine (if it be such) remains as discordant with natural science as ever.

It is not true that the species composing any one of the three populations originated during any one of three successive periods of time, and not at any other of these.

Undoubtedly, it is in the highest degree probable that animal life appeared first under aquatic conditions; that terrestrial forms appeared later, and flying animals only after land animals; but it is, at the same time, testified by all the evidence we possess, that the great majority, if not the whole, of the primordial species of each division have long since died out and have been replaced by a vast succession of new forms. Hundreds of thousands of animal species, as distinct as those which now compose our water, land, and air-populations, have come into existence and died out again, throughout the æons of geological time which separate us from the lower Palæozoic epoch, when, as I have pointed out, our present evidence of the existence of such distinct populations commences.

If the species of animals have all been separately created, then it follows that hundreds of thousands of acts of creative energy have occurred, at intervals, throughout the whole time recorded by the fossiliferous rocks ; and, during the greater part of that time, the " creation " of the members of the water, land, and air-populations must have gone on contemporaneously.

If we represent the water, land, and air-populations by *a*, *b*, and *c* respectively, and take vertical succession on the page to indicate order in time, then the following schemes will roughly shadow forth the contrast I have been endeavouring to explain :—

Genesis (as interpreted by Mr. Gladstone).	Nature (as interpreted by natural science).
b b b	$c^1\ a^3\ b^2$
c c c	$c\ a^3\ b^1$
a a a	$b\ a^1\ b$
	a a a

So far as I can see, there is only one resource left for those modern representatives of Sisyphus, the reconcilers of Genesis with science ; and it has the advantage of being founded on a perfectly legitimate appeal to our ignorance. It has been seen that, on any interpretation of the terms water-population and land-population, it must be admitted that invertebrate representatives of these populations existed during the lower Palæozoic epoch. No evolutionist can hesitate to admit that other land animals (and possibly vertebrates among

them) may have existed during that time, of the history of which we know so little; and, further, that scorpions are animals of such high organisation that it is highly probable their existence indicates that of a long antecedent land-population of a similar character.

Then, since the land-population is said not to have been created until the sixth day, it necessarily follows that the evidence of the order in which animals appeared must be sought in the record of those older Palæozoic times in which only traces of the water-population have as yet been discovered.

Therefore, if any one chooses to say that the creative work took place in the Cambrian or Laurentian epoch, in exactly that manner which Mr. Gladstone does, and natural science does not, affirm, natural science is not in a position to disprove the accuracy of the statement. Only one cannot have one's cake and eat it too, and such safety from the contradiction of science means the forfeiture of her support.

Whether the account of the work of the first, second, and third days in Genesis would be confirmed by the demonstration of the truth of the nebular hypothesis; whether it is corroborated by what is known of the nature and probable relative antiquity of the heavenly bodies; whether, if the Hebrew word translated "firmament" in the Authorised Version really means "expanse," the assertion that the waters are partly under

this "expanse" and partly above it would be any more confirmed by the ascertained facts of physical geography and meteorology than it was before; whether the creation of the whole vegetable world, and especially of "grass, herb yielding seed after its kind, and tree bearing fruit," before any kind of animal, is "affirmed" by the apparently plain teaching of botanical palæontology, that grasses and fruit-trees originated long subsequently to animals—all these are questions which, if I mistake not, would be answered decisively in the negative by those who are specially conversant with the sciences involved. And it must be recollected that the issue raised by Mr. Gladstone is not whether, by some effort of ingenuity, the pentateuchal story can be shown to be not disprovable by scientific knowledge, but whether it is supported thereby.

There is nothing, then, in the criticisms of Dr. Réville but what rather tends to confirm than to impair the old-fashioned belief that there is a revelation in the book of Genesis (p. 694).

The form into which Mr. Gladstone has thought fit to throw this opinion leaves me in doubt as to its substance. I do not understand how a hostile criticism can, under any circumstances, tend to confirm that which it attacks. If, however, Mr. Gladstone merely means to express his personal impression, "as one wholly destitute of that kind of knowledge which carries authority," that he

has destroyed the value of these criticisms, I have neither the wish nor the right to attempt to disturb his faith. On the other hand, I may be permitted to state my own conviction, that, so far as natural science is involved, M. Réville's observations retain the exact value they possessed before Mr. Gladstone attacked them.

Trusting that I have now said enough to secure the author of a wise and moderate disquisition upon a topic which seems fated to stir unwisdom and fanaticism to their depths, a fuller measure of justice than has hitherto been accorded to him, I retire from my self-appointed championship, with the hope that I shall not hereafter be called upon by M. Réville to apologise for damage done to his strong case by imperfect or impulsive advocacy. But, perhaps, I may be permitted to add a word or two, on my own account, in reference to the great question of the relations between science and religion; since it is one about which I have thought a good deal ever since I have been able to think at all; and about which I have ventured to express my views publicly, more than once, in the course of the last thirty years.

The antagonism between science and religion, about which we hear so much, appears to me to be purely factitious—fabricated, on the one hand, by short-sighted religious people who confound a

certain branch of science, theology, with religion; and, on the other, by equally short-sighted scientific people who forget that science takes for its province only that which is susceptible of clear intellectual comprehension; and that, outside the boundaries of that province, they must be content with imagination, with hope, and with ignorance.

It seems to me that the moral and intellectual life of the civilised nations of Europe is the product of that interaction, sometimes in the way of antagonism, sometimes in that of profitable interchange, of the Semitic and the Aryan races, which commenced with the dawn of history, when Greek and Phœnician came in contact, and has been continued by Carthaginian and Roman, by Jew and Gentile, down to the present day. Our art (except, perhaps, music) and our science are the contributions of the Aryan; but the essence of our religion is derived from the Semite. In the eighth century B.C., in the heart of a world of idolatrous polytheists, the Hebrew prophets put forth a conception of religion which appears to me to be as wonderful an inspiration of genius as the art of Pheidias or the science of Aristotle.

"And what doth the Lord require of thee, but to do justly, and to love mercy, and to walk humbly with thy God?"

If any so-called religion takes away from this great saying of Micah, I think it wantonly muti-

lates, while, if it adds thereto, I think it obscures, the perfect ideal of religion.

But what extent of knowledge, what acuteness of scientific criticism, can touch this, if any one possessed of knowledge, or acuteness, could be absurd enough to make the attempt? Will the progress of research prove that justice is worthless and mercy hateful; will it ever soften the bitter contrast between our actions and our aspirations; or show us the bounds of the universe, and bid us say, Go to, now we comprehend the infinite? A faculty of wrath lay in those ancient Israelites, and surely the prophet's staff would have made swift acquaintance with the head of the scholar who had asked Micah whether, peradventure, the Lord further required of him an implicit belief in the accuracy of the cosmogony of Genesis!

What we are usually pleased to call religion nowadays is, for the most part, Hellenised Judaism; and, not unfrequently, the Hellenic element carries with it a mighty remnant of old-world paganism and a great infusion of the worst and weakest products of Greek scientific speculation; while fragments of Persian and Babylonian, or rather Accadian, mythology burden the Judaic contribution to the common stock.

The antagonism of science is not to religion, but to the heathen survivals and the bad philosophy under which religion herself is often well-

nigh crushed. And, for my part, I trust that this antagonism will never cease; but that, to the end of time, true science will continue to fulfil one of her most beneficent functions, that of relieving men from the burden of false science which is imposed upon them in the name of religion.

This is the work that M. Réville and men such as he are doing for us; this is the work which his opponents are endeavouring, consciously or unconsciously, to hinder.

V

MR. GLADSTONE AND GENESIS

[1886]

In controversy, as in courtship, the good old rule to be off with the old before one is on with the new, greatly commends itself to my sense of expediency. And, therefore, it appears to me desirable that I should preface such observations as I may have to offer upon the cloud of arguments (the relevancy of which to the issue which I had ventured to raise is not always obvious) put forth by Mr. Gladstone in the January number of this review,[1] by an endeavour to make clear to such of our readers as have not had the advantage of a forensic education the present net result of the discussion.

I am quite aware that, in undertaking this task, I run all the risks to which the man who presumes to deal judicially with his own cause is liable.

[1] *The Nineteenth Century*, 1886.

But it is exactly because I do not shun that risk, but, rather, earnestly desire to be judged by him who cometh after me, provided that he has the knowledge and impartiality appropriate to a judge, that I adopt my present course.

In the article on "The Dawn of Creation and Worship," it will be remembered that Mr. Gladstone unreservedly commits himself to three propositions. The first is that, according to the writer of the Pentateuch, the "water-population," the "air-population," and the "land-population" of the globe were created successively, in the order named. In the second place, Mr. Gladstone authoritatively asserts that this (as part of his "fourfold order") has been "so affirmed in our time by natural science, that it may be taken as a demonstrated conclusion and established fact." In the third place, Mr. Gladstone argues that the fact of this coincidence of the pentateuchal story with the results of modern investigation makes it "impossible to avoid the conclusion, first, that either this writer was gifted with faculties passing all human experience, or else his knowledge was divine." And having settled to his own satisfaction that the first "branch of the alternative is truly nominal and unreal," Mr. Gladstone continues, "So stands the plea for a revelation of truth from God, a plea only to be met by questioning its possibility" (p. 697).

I am a simple-minded person, wholly devoid of

subtlety of intellect, so that I willingly admit that there may be depths of alternative meaning in these propositions out of all soundings attainable by my poor plummet. Still there are a good many people who suffer under a like intellectual limitation; and, for once in my life, I feel that I have the chance of attaining that position of a representative of average opinion which appears to be the modern ideal of a leader of men, when I make free confession that, after turning the matter over in my mind, with all the aid derived from a careful consideration of Mr. Gladstone's reply, I cannot get away from my original conviction that, if Mr. Gladstone's second proposition can be shown to be not merely inaccurate, but directly contradictory of facts known to every one who is acquainted with the elements of natural science, the third proposition collapses of itself.

And it was this conviction which led me to enter upon the present discussion. I fancied that if my respected clients, the people of average opinion and capacity, could once be got distinctly to conceive that Mr. Gladstone's views as to the proper method of dealing with grave and difficult scientific and religious problems had permitted him to base a solemn "plea for a revelation of truth from God" upon an error as to a matter of fact, from which the intelligent perusal of a manual of palæontology would have saved him, I need not trouble myself to occupy their time and attention

with further comments upon his contribution to apologetic literature. It is for others to judge whether I have efficiently carried out my project or not. It certainly does not count for much that I should be unable to find any flaw in my own case, but I think it counts for a good deal that Mr. Gladstone appears to have been equally unable to do so. He does, indeed, make a great parade of authorities, and I have the greatest respect for those authorities whom Mr. Gladstone mentions. If he will get them to sign a joint memorial to the effect that our present palæontological evidence proves that birds appeared before the "land-population" of terrestrial reptiles, I shall think it my duty to reconsider my position—but not till then.

It will be observed that I have cautiously used the word "appears" in referring to what seems to me to be absence of any real answer to my criticisms in Mr. Gladstone's reply. For I must honestly confess that, notwithstanding long and painful strivings after clear insight, I am still uncertain whether Mr. Gladstone's "Defence" means that the great "plea for a revelation from God" is to be left to perish in the dialectic desert; or whether it is to be withdrawn under the protection of such skirmishers as are available for covering retreat.

In particular, the remarkable disquisition which covers pages 11 to 14 of Mr. Gladstone's last contribution has greatly exercised my mind.

Socrates is reported to have said of the works of Heraclitus that he who attempted to comprehend them should be a "Delian swimmer," but that, for his part, what he could understand was so good that he was disposed to believe in the excellence of that which he found unintelligible. In endeavouring to make myself master of Mr. Gladstone's meaning in these pages, I have often been overcome by a feeling analogous to that of Socrates, but not quite the same. That which I do understand has appeared to me so very much the reverse of good, that I have sometimes permitted myself to doubt the value of that which I do not understand.

In this part of Mr. Gladstone's reply, in fact, I find nothing of which the bearing upon my arguments is clear to me, except that which relates to the question whether reptiles, so far as they are represented by tortoises and the great majority of lizards and snakes, which are land animals, are creeping things in the sense of the pentateuchal writer or not.

I have every respect for the singer of the Song of the Three Children (whoever he may have been); I desire to cast no shadow of doubt upon, but, on the contrary, marvel at, the exactness of Mr. Gladstone's information as to the considerations which "affected the method of the Mosaic writer"; nor do I venture to doubt that the inconvenient intrusion of these contemptible rep-

tiles—"a family fallen from greatness" (p. 14), a miserable decayed aristocracy reduced to mere "skulkers about the earth" (*ibid.*)—in consequence, apparently, of difficulties about the occupation of land arising out of the earth-hunger of their former serfs, the mammals—into an apologetic argument, which otherwise would run quite smoothly, is in every way to be deprecated. Still, the wretched creatures stand there, importunately demanding notice; and, however different may be the practice in that contentious atmosphere with which Mr. Gladstone expresses and laments his familiarity, in the atmosphere of science it really is of no avail whatever to shut one's eyes to facts, or to try to bury them out of sight under a tumulus of rhetoric. That is my experience of the "Elysian regions of Science," wherein it is a pleasure to me to think that a man of Mr. Gladstone's intimate knowledge of English life, during the last quarter of a century, believes my philosophic existence to have been rounded off in unbroken equanimity.

However reprehensible, and indeed contemptible, terrestrial reptiles may be, the only question which appears to me to be relevant to my argument is whether these creatures are or are not comprised under the denomination of "everything that creepeth upon the ground."

Mr. Gladstone speaks of the author of the first chapter of Genesis as "the Mosaic writer";

I suppose, therefore, that he will admit that it is equally proper to speak of the author of Leviticus as the "Mosaic writer." Whether such a phrase would be used by any one who had an adequate conception of the assured results of modern Biblical criticism is another matter; but, at any rate, it cannot be denied that Leviticus has as much claim to Mosaic authorship as Genesis. Therefore, if one wants to know the sense of a phrase used in Genesis, it will be well to see what Leviticus has to say on the matter. Hence, I commend the following extract from the eleventh chapter of Leviticus to Mr. Gladstone's serious attention:—

> And these are they which are unclean unto you among the creeping things that creep upon the earth: the weasel, and the mouse, and the great lizard after its kind, and the gecko, and the land-crocodile, and the sand-lizard, and the chameleon. These are they which are unclean to you among all that creep (v. 29-31).

The merest Sunday-school exegesis therefore suffices to prove that when the "Mosaic writer" in Genesis i. 24 speaks of "creeping things," he means to include lizards among them.

This being so, it is agreed, on all hands, that terrestrial lizards, and other reptiles allied to lizards, occur in the Permian strata. It is further agreed that the Triassic strata were deposited after these. Moreover, it is well known that, even if certain footprints are to be

taken as unquestionable evidence of the existence of birds, they are not known to occur in rocks earlier than the Trias, while indubitable remains of birds are to be met with only much later. Hence it follows that natural science does not "affirm" the statement that birds were made on the fifth day, and "everything that creepeth on the ground" on the sixth, on which Mr. Gladstone rests his order; for, as is shown by Leviticus, the "Mosaic writer" includes lizards among his "creeping things."

Perhaps I have given myself superfluous trouble in the preceding argument, for I find that Mr. Gladstone is willing to assume (he does not say to admit) that the statement in the text of Genesis as to reptiles cannot "in all points be sustained" (p. 16). But my position is that it cannot be sustained in any point, so that, after all, it has perhaps been as well to go over the evidence again. And then Mr. Gladstone proceeds as if nothing had happened to tell us that—

> There remain great unshaken facts to be weighed. First, the fact that such a record should have been made at all.

As most peoples have their cosmogonies, this "fact" does not strike me as having much value.

> Secondly, the fact that, instead of dwelling in generalities, it has placed itself under the severe conditions of a chronological order reaching from the first *nisus* of chaotic matter to the

consummated production of a fair and goodly, a furnished and a peopled world.

This "fact" can be regarded as of value only by ignoring the fact demonstrated in my previous paper, that natural science does not confirm the order asserted so far as living things are concerned; and by upsetting a fact to be brought to light presently, to wit, that, in regard to the rest of the pentateuchal cosmogony, prudent science has very little to say one way or the other.

Thirdly, the fact that its cosmogony seems, in the light of the nineteenth century, to draw more and more of countenance from the best natural philosophy.

I have already questioned the accuracy of this statement, and I do not observe that mere repetition adds to its value.

And, fourthly, that it has described the successive origins of the five great categories of present life with which human experience was and is conversant, in that order which geological authority confirms.

By comparison with a sentence on page 14, in which a fivefold order is substituted for the "fourfold order," on which the "plea for revelation" was originally founded, it appears that these five categories are "plants, fishes, birds, mammals, and man," which, Mr. Gladstone affirms, "are given to us in Genesis in the order of succession in which they are also given by the latest geological authorities."

I must venture to demur to this statement. I showed, in my previous paper, that there is no reason to doubt that the term "great sea monster" (used in Gen. i. 21) includes the most conspicuous of great sea animals—namely, whales, dolphins, porpoises, manatees, and dugongs;[1] and, as these are indubitable mammals, it is impossible to affirm that mammals come after birds, which are said to have been created on the same day. Moreover, I pointed out that as these Cetacea and Sirenia are certainly modified land animals, their existence implies the antecedent existence of land mammals.

Furthermore, I have to remark that the term "fishes," as used, technically, in zoology, by no means covers all the moving creatures that have life, which are bidden to "fill the waters in the seas" (Gen. i. 20-22.) Marine mollusks and crustacea, echinoderms, corals, and foraminifera are not technically fishes. But they are abundant in the palæozoic rocks, ages upon ages older than those in which the first evidences of true fishes appear. And if, in a geological book, Mr. Gladstone finds the quite true statement that plants appeared before fishes, it is only by a complete misunderstanding that he can be led to imagine it serves his purpose.

[1] Both dolphins and dugongs occur in the Red Sea, porpoises and dolphins in the Mediterranean; so that the "Mosaic writer" may well have been acquainted with them.

As a matter of fact, at the present moment, it is a question whether, on the bare evidence afforded by fossils, the marine creeping thing or the marine plant has the seniority. No cautious palæontologist would express a decided opinion on the matter. But, if we are to read the pentateuchal statement as a scientific document (and, in spite of all protests to the contrary, those who bring it into comparison with science do seek to make a scientific document of it), then, as it is quite clear that only terrestrial plants of high organisation are spoken of in verses 11 and 12, no palæontologist would hesitate to say that, at present, the records of sea animal life are vastly older than those of any land plant describable as "grass, herb yielding seed or fruit-tree."

Thus, although, in Mr. Gladstone's "Defence," the "old order passeth into new," his case is not improved. The fivefold order is no more "affirmed in our time by natural science" to be "a demonstrated conclusion and established fact" than the fourfold order was. Natural science appears to me to decline to have anything to do with either; they are as wrong in detail as they are mistaken in principle.

There is another change of position, the value of which is not so apparent to me, as it may well seem to be to those who are unfamiliar with the subject under discussion. Mr. Gladstone

discards his three groups of "water-population," "air-population," and "land-population," and substitutes for them (1) fishes, (2) birds, (3) mammals, (4) man. Moreover, it is assumed, in a note, that "the higher or ordinary mammals" alone were known to the "Mosaic writer" (p. 6). No doubt it looks, at first, as if something were gained by this alteration; for, as I have just pointed out, the word "fishes" can be used in two senses, one of which has a deceptive appearance of adjustability to the "Mosaic" account. Then the inconvenient reptiles are banished out of sight; and, finally, the question of the exact meaning of "higher" and "ordinary" in the case of mammals opens up the prospect of a hopeful logomachy. But what is the good of it all in the face of Leviticus on the one hand and of palæontology on the other?

As, in my apprehension, there is not a shadow of justification for the suggestion that when the pentateuchal writer says "fowl" he excludes bats (which, as we shall see directly, are expressly included under "fowl" in Leviticus), and as I have already shown that he demonstrably includes reptiles, as well as mammals, among the creeping things of the land, I may be permitted to spare my readers further discussion of the "fivefold order." On the whole, it is seen to be rather more inconsistent with Genesis than its fourfold predecessor.

But I have yet a fresh order to face. Mr. Gladstone (p. 11) understands "the main statements of Genesis in successive order of time, but without any measurement of its divisions, to be as follows:—

1. A period of land, anterior to all life (v. 9, 10).
2. A period of vegetable life, anterior to animal life (v. 11, 12).
3. A period of animal life, in the order of fishes (v. 20).
4. Another stage of animal life, in the order of birds.
5. Another in the order of beasts (v. 24, 25).
6. Last of all, man (v. 26, 27).

Mr. Gladstone then tries to find the proof of the occurrence of a similar succession in sundry excellent works on geology.

I am really grieved to be obliged to say that this third (or is it fourth?) modification of the foundation of the "plea for revelation" originally set forth, satisfies me as little as any of its predecessors.

For, in the first place, I cannot accept the assertion that this order is to be found in Genesis. With respect to No. 5, for example, I hold, as I have already said, that "great sea monsters" includes the Cetacea, in which case mammals (which is what, I suppose, Mr. Gladstone means by "beasts") come in under head No. 3, and not under No. 5. Again, "fowl" are said in Genesis to be created on the same day as fishes; therefore I cannot accept an order which makes birds

succeed fishes. Once more, as it is quite certain that the term "fowl" includes the bats,—for in Leviticus xi. 13-19 we read, "And these shall ye have in abomination among the fowls . . . the heron after its kind, and the hoopoe, and the bat,"—it is obvious that bats are also said to have been created at stage No. 3. And as bats are mammals, and their existence obviously presupposes that of terrestrial "beasts," it is quite clear that the latter could not have first appeared as No. 5. I need not repeat my reasons for doubting whether man came "last of all."

As the latter half of Mr. Gladstone's sixfold order thus shows itself to be wholly unauthorised by, and inconsistent with, the plain language of the Pentateuch, I might decline to discuss the admissibility of its former half.

But I will add one or two remarks on this point also. Does Mr. Gladstone mean to say that in any of the works he has cited, or indeed anywhere else, he can find scientific warranty for the assertion that there was a period of land—by which I suppose he means dry land (for submerged land must needs be as old as the separate existence of the sea)—"anterior to all life"?

It may be so, or it may not be so; but where is the evidence which would justify any one in making a positive assertion on the subject? What competent palæontologist will affirm, at this present moment, that he knows anything about

the period at which life originated, or will assert more than the extreme probability that such origin was a long way antecedent to any traces of life at present known? What physical geologist will affirm that he knows when dry land began to exist, or will say more than that it was probably very much earlier than any extant direct evidence of terrestrial conditions indicates?

I think I know pretty well the answers which the authorities quoted by Mr. Gladstone would give to these questions; but I leave it to them to give them if they think fit.

If I ventured to speculate on the matter at all, I should say it is by no means certain that sea is older than dry land, inasmuch as a solid terrestrial surface may very well have existed before the earth was cool enough to allow of the existence of fluid water. And, in this case, dry land may have existed before the sea. As to the first appearance of life, the whole argument of analogy, whatever it may be worth in such a case, is in favour of the absence of living beings until long after the hot water seas had constituted themselves; and of the subsequent appearance of aquatic before terrestrial forms of life. But whether these "protoplasts" would, if we could examine them, be reckoned among the lowest microscopic algæ, or fungi; or among those doubtful organisms which lie in the debatable land between animals and plants, is, in my judgment,

a question on which a prudent biologist will reserve his opinion.

I think that I have now disposed of those parts of Mr. Gladstone's defence in which I seem to discover a design to rescue his solemn "plea for revelation." But a great deal of the "Proem to Genesis" remains which I would gladly pass over in silence, were such a course consistent with the respect due to so distinguished a champion of the "reconcilers."

I hope that my clients—the people of average opinions—have by this time some confidence in me; for when I tell them that, after all, Mr. Gladstone is of opinion that the "Mosaic record" was meant to give moral, and not scientific, instruction to those for whom it was written, they may be disposed to think that I must be misleading them. But let them listen further to what Mr. Gladstone says in a compendious but not exactly correct statement respecting my opinions:—

> He holds the writer responsible for scientific precision: I look for nothing of the kind, but assign to him a statement general, which admits exceptions; popular, which aims mainly at producing moral impression; summary, which cannot but be open to more or less of criticism of detail. He thinks it is a lecture. I think it is a sermon (p. 5).

I note, incidentally, that Mr. Gladstone appears to consider that the *differentia* between a lecture

and a sermon is, that the former, so far as it deals with matters of fact, may be taken seriously, as meaning exactly what it says, while a sermon may not. I have quite enough on my hands without taking up the cudgels for the clergy, who will probably find Mr. Gladstone's definition unflattering.

But I am diverging from my proper business, which is to say that I have given no ground for the ascription of these opinions; and that, as a matter of fact, I do not hold them and never have held them. It is Mr. Gladstone, and not I, who will have it that the pentateuchal cosmogony is to be taken as science.

My belief, on the contrary, is, and long has been, that the pentateuchal story of the creation is simply a myth. I suppose it to be an hypothesis respecting the origin of the universe which some ancient thinker found himself able to reconcile with his knowledge, or what he thought was knowledge, of the nature of things, and therefore assumed to be true. As such, I hold it to be not merely an interesting, but a venerable, monument of a stage in the mental progress of mankind; and I find it difficult to suppose that any one who is acquainted with the cosmogonies of other nations—and especially with those of the Egyptians and the Babylonians, with whom the Israelites were in such frequent and intimate communication—should consider it to possess

either more, or less, scientific importance than may be allotted to these.

Mr. Gladstone's definition of a sermon permits me to suspect that he may not see much difference between that form of discourse and what I call a myth; and I hope it may be something more than the slowness of apprehension, to which I have confessed, which leads me to imagine that a statement which is "general" but "admits exceptions," which is "popular" and "aims mainly at producing moral impression," "summary" and therefore open to "criticism of detail," amounts to a myth, or perhaps less than a myth. Put algebraically, it comes to this, $x = a + b + c$; always remembering that there is nothing to show the exact value of either a, or b, or c. It is true that a is commonly supposed to equal 10, but there are exceptions, and these may reduce it to 8, or 3, or 0; b also popularly means 10, but being chiefly used by the algebraist as a "moral" value, you cannot do much with it in the addition or subtraction of mathematical values; c also is quite "summary," and if you go into the details of which it is made up, many of them may be wrong, and their sum total equal to 0, or even to a minus quantity.

Mr. Gladstone appears to wish that I should (1) enter upon a sort of essay competition with the author of the pentateuchal cosmogony; (2) that I should make a further statement about some elementary facts in the history of Indian and Greek

philosophy; and (3) that I should show cause for my hesitation in accepting the assertion that Genesis is supported, at any rate to the extent of the first two verses, by the nebular hypothesis.

A certain sense of humour prevents me from accepting the first invitation. I would as soon attempt to put Hamlet's soliloquy into a more scientific shape. But if I supposed the "Mosaic writer" to be inspired, as Mr. Gladstone does, it would not be consistent with my notions of respect for the Supreme Being to imagine Him unable to frame a form of words which should accurately, or, at least, not inaccurately, express His own meaning. It is sometimes said that, had the statements contained in the first chapter of Genesis been scientifically true, they would have been unintelligible to ignorant people; but how is the matter mended if, being scientifically untrue, they must needs be rejected by instructed people?

With respect to the second suggestion, it would be presumptuous in me to pretend to instruct Mr. Gladstone in matters which lie as much within the province of Literature and History as in that of Science; but if any one desirous of further knowledge will be so good as to turn to that most excellent and by no means recondite source of information, the "Encyclopædia Britannica," he will find, under the letter E, the word "Evolution," and a long article on that subject. Now, I do not recommend him to read the first half of the

article; but the second half, by my friend Mr. Sully, is really very good. He will there find it said that in some of the philosophies of ancient India, the idea of evolution is clearly expressed: "Brahma is conceived as the eternal self-existent being, which, on its material side, unfolds itself to the world by gradually condensing itself to material objects through the gradations of ether, fire, water, earth, and other elements." And again: "In the later system of emanation of Sankhya there is a more marked approach to a materialistic doctrine of evolution." What little knowledge I have of the matter—chiefly derived from that very instructive book, "Die Religion des Buddha," by C. F. Koeppen, supplemented by Hardy's interesting works—leads me to think that Mr. Sully might have spoken much more strongly as to the evolutionary character of Indian philosophy, and especially of that of the Buddhists. But the question is too large to be dealt with incidentally.

And, with respect to early Greek philosophy,[1] the seeker after additional enlightenment need go no further than the same excellent storehouse of information:—

> The early Ionian physicists, including Thales, Anaximander, and Anaximenes, seek to explain the world as generated out of

[1] I said nothing about "the greater number of schools of Greek philosophy," as Mr. Gladstone implies that I did, but expressly spoke of the "founders of Greek philosophy."

a primordial matter which is at the same time the universal support of things. This substance is endowed with a generative or transmutative force by virtue of which it passes into a succession of forms. They thus resemble modern evolutionists, since they regard the world, with its infinite variety of forms, as issuing from a simple mode of matter.

Further on, Mr. Sully remarks that "Heraclitus deserves a prominent place in the history of the idea of evolution," and he states, with perfect justice, that Heraclitus has foreshadowed some of the special peculiarities of Mr. Darwin's views. It is indeed a very strange circumstance that the philosophy of the great Ephesian more than adumbrates the two doctrines which have played leading parts, the one in the development of Christian dogma, the other in that of natural science. The former is the conception of the Word (λόγος) which took its Jewish shape in Alexandria, and its Christian form [1] in that Gospel which is usually referred to an Ephesian source of some five centuries later date; and the latter is that of the struggle for existence. The saying that "strife is father and king of all" (πόλεμος πάντων μὲν πατήρ ἐστι, πάντων δὲ βασιλεύς), ascribed to Heraclitus, would be a not inappropriate motto for the "Origin of Species."

I have referred only to Mr. Sully's article, because his authority is quite sufficient for my purpose. But the consultation of any of the more elaborate histories of Greek philosophy, such as

[1] See Heinze, *Die Lehre vom Logos*, p. 9 *et seq.*

the great work of Zeller, for example, will only bring out the same fact into still more striking prominence. I have professed no "minute acquaintance" with either Indian or Greek philosophy, but I have taken a great deal of pains to secure that such knowledge as I do possess shall be accurate and trustworthy.

In the third place, Mr. Gladstone appears to wish that I should discuss with him the question whether the nebular hypothesis is, or is not, confirmatory of the pentateuchal account of the origin of things. Mr. Gladstone appears to be prepared to enter upon this campaign with a light heart. I confess I am not, and my reason for this backwardness will doubtless surprise Mr. Gladstone. It is that, rather more than a quarter of a century ago (namely, in February 1859), when it was my duty, as President of the Geological Society, to deliver the Anniversary Address,[1] I chose a topic which involved a very careful study of the remarkable cosmogonical speculation, originally promulgated by Immanuel Kant and, subsequently, by Laplace, which is now known as the nebular hypothesis. With the help of such little acquaintance with the principles of physics and astronomy as I had gained, I endeavoured to obtain a clear understanding of this speculation in all its bearings. I am not sure that I succeeded; but of this I am certain, that the problems involved

[1] Reprinted in *Lay Sermons, Addresses, and Reviews*, 1870.

are very difficult, even for those who possess the intellectual discipline requisite for dealing with them. And it was this conviction that led me to express my desire to leave the discussion of the question of the asserted harmony between Genesis and the nebular hypothesis to experts in the appropriate branches of knowledge. And I think my course was a wise one; but as Mr. Gladstone evidently does not understand how there can be any hesitation on my part, unless it arises from a conviction that he is in the right, I may go so far as to set out my difficulties.

They are of two kinds—exegetical and scientific. It appears to me that it is vain to discuss a supposed coincidence between Genesis and science unless we have first settled, on the one hand, what Genesis says, and, on the other hand, what science says.

In the first place, I cannot find any consensus among Biblical scholars as to the meaning of the words, "In the beginning God created the heaven and the earth." Some say that the Hebrew word *bara*, which is translated "create," means "made out of nothing." I venture to object to that rendering, not on the ground of scholarship, but of common sense. Omnipotence itself can surely no more make something "out of" nothing than it can make a triangular circle. What is intended by "made out of nothing" appears to be "caused to come into existence," with the implication that

nothing of the same kind previously existed. It is further usually assumed that "the heaven and the earth" means the material substance of the universe. Hence the "Mosaic writer" is taken to imply that where nothing of a material nature previously existed, this substance appeared. That is perfectly conceivable, and therefore no one can deny that it may have happened. But there are other very authoritative critics who say that the ancient Israelite[1] who wrote the passage was not likely to have been capable of such abstract thinking; and that, as a matter of philology, *bara* is commonly used to signify the "fashioning," or "forming," of that which already exists. Now it appears to me that the scientific investigator is wholly incompetent to say anything at all about the first origin of the material universe. The whole power of his organon vanishes when he has to step beyond the chain of natural causes and effects. No form of the nebular hypothesis, that I know of, is necessarily connected with any view of the origination of the nebular substance. Kant's form of it expressly supposes that the nebular material from which one stellar system starts may be nothing but the disintegrated substance of a stellar and planetary system which has just come

[1] "Ancient," doubtless, but his antiquity must not be exaggerated. For example, there is no proof that the "Mosaic" cosmogony was known to the Israelites of Solomon's time.

to an end. Therefore, so far as I can see, one who believes that matter has existed from all eternity has just as much right to hold the nebular hypothesis as one who believes that matter came into existence at a specified epoch. In other words, the nebular hypothesis and the creation hypothesis, up to this point, neither confirm nor oppose one another.

Next, we read in the revisers' version, in which I suppose the ultimate results of critical scholarship to be embodied: "And the earth was waste ['without form,' in the Authorised Version] and void." Most people seem to think that this phraseology intends to imply that the matter out of which the world was to be formed was a veritable "chaos," devoid of law and order. If this interpretation is correct, the nebular hypothesis can have nothing to say to it. The scientific thinker cannot admit the absence of law and order, anywhere or anywhen, in nature. Sometimes law and order are patent and visible to our limited vision; sometimes they are hidden. But every particle of the matter of the most fantastic-looking nebula in the heavens is a realm of law and order in itself; and, that it is so, is the essential condition of the possibility of solar and planetary evolution from the apparent chaos.[1]

[1] When Jeremiah (iv. 23) says, "I beheld the earth, and, lo, it was waste and void," he certainly does not mean to imply that the form of the earth was less definite, or its substance less solid, than before.

"Waste" is too vague a term to be worth consideration. "Without form," intelligible enough as a metaphor, if taken literally is absurd; for a material thing existing in space must have a superficies, and if it has a superficies it has a form. The wildest streaks of marestail clouds in the sky, or the most irregular heavenly nebulæ, have surely just as much form as a geometrical tetrahedron; and as for "void," how can that be void which is full of matter? As poetry, these lines are vivid and admirable; as a scientific statement, which they must be taken to be if any one is justified in comparing them with another scientific statement, they fail to convey any intelligible conception to my mind.

The account proceeds: "And darkness was upon the face of the deep." So be it; but where, then, is the likeness to the celestial nebulæ, of the existence of which we should know nothing unless they shone with a light of their own? "And the spirit of God moved upon the face of the waters." I have met with no form of the nebular hypothesis which involves anything analogous to this process.

I have said enough to explain some of the difficulties which arise in my mind, when I try to ascertain whether there is any foundation for the contention that the statements contained in the first two verses of Genesis are supported by the nebular hypothesis. The result does not appear to me to be exactly favourable to that contention.

The nebular hypothesis assumes the existence of matter, having definite properties, as its foundation. Whether such matter was created a few thousand years ago, or whether it has existed through an eternal series of metamorphoses of which our present universe is only the last stage, are alternatives, neither of which is scientifically untenable, and neither scientifically demonstrable. But science knows nothing of any stage in which the universe could be said, in other than a metaphorical and popular sense, to be formless or empty; or in any respect less the seat of law and order than it is now. One might as well talk of a fresh-laid hen's egg being "without form and void," because the chick therein is potential and not actual, as apply such terms to the nebulous mass which contains a potential solar system.

Until some further enlightenment comes to me, then, I confess myself wholly unable to understand the way in which the nebular hypothesis is to be converted into an ally of the "Mosaic writer."[1]

[1] In looking through the delightful volume recently published by the Astronomer-Royal for Ireland, a day or two ago, I find the following remarks on the nebular hypothesis, which I should have been glad to quote in my text if I had known them sooner :—

"Nor can it be ever more than a speculation; it cannot be established by observation, nor can it be proved by calculation. It is merely a conjecture, more or less plausible, but perhaps, in some degree, necessarily true, if our present laws of heat, as we understand them, admit of the extreme application here required, and if the present order of things has reigned for

But Mr. Gladstone informs us that Professor Dana and Professor Guyot are prepared to prove that the "first or cosmogonical portion of the Proem not only accords with, but teaches, the nebular hypothesis." There is no one to whose authority on geological questions I am more readily disposed to bow than that of my eminent friend Professor Dana. But I am familiar with what he has previously said on this topic in his well-known and standard work, into which, strangely enough, it does not seem to have occurred to Mr. Gladstone to look before he set out upon his present undertaking; and unless Professor Dana's latest contribution (which I have not yet met with) takes up altogether new ground, I am afraid I shall not be able to extricate myself, by its help, from my present difficulties.

It is a very long time since I began to think about the relations between modern scientifically ascertained truths and the cosmogonical speculations of the writer of Genesis; and, as I think that Mr. Gladstone might have been able to put his case with a good deal more force, if he had thought it worth while to consult the last chapter of Professor Dana's admirable "Manual of Geology," so I think he might have been made aware that

sufficient time without the intervention of any influence at present known to us" (*The Story of the Heavens*, p. 506).

Would any prudent advocate base a plea, either for or against revelation, upon the coincidence, or want of coincidence, of the declarations of the latter with the requirements of an hypothesis thus guardedly dealt with by an astronomical expert?

he was undertaking an enterprise of which he had not counted the cost, if he had chanced upon a discussion of the subject which I published in 1877.[1]

Finally, I should like to draw the attention of those who take interest in these topics to the weighty words of one of the most learned and moderate of Biblical critics :—

A propos de cette première page de la Bible, on a coutume de nos jours de disserter, à perte de vue, sur l'accord du récit mosaïque avec les sciences naturelles ; et comme celles-ci, tout éloignées qu'elles sont encore de la perfection absolue, ont rendu populaires et en quelque sorte irréfragables un certain nombre de faits généraux ou de thèses fondamentales de la cosmologie et de la géologie, c'est le texte sacré qu'on s'évertue à torturer pour le faire concorder avec ces données.[2]

In my paper on the "Interpreters of Nature and the Interpreters of Genesis," while freely availing myself of the rights of a scientific critic, I endeavoured to keep the expression of my views well within those bounds of courtesy which are set by self-respect and consideration for others. I am therefore glad to be favoured with Mr. Gladstone's acknowledgment of the success of my efforts. I only wish that I could accept all the products of Mr. Gladstone's gracious appreciation, but there is one about which, as a matter of honesty, I hesitate. In fact, if I had expressed my

[1] Lectures on Evolution delivered in New York (American Addresses).

[2] Reuss, *L'Histoire Sainte et la Loi*, vol. i. p. 275.

meaning better than I seem to have done, I doubt if this particular proffer of Mr. Gladstone's thanks would have been made.

To my mind, whatever doctrine professes to be the result of the application of the accepted rules of inductive and deductive logic to its subject-matter; and which accepts, within the limits which it sets to itself, the supremacy of reason, is Science. Whether the subject-matter consists of realities or unrealities, truths or falsehoods, is quite another question. I conceive that ordinary geometry is science, by reason of its method, and I also believe that its axioms, definitions, and conclusions are all true. However, there is a geometry of four dimensions, which I also believe to be science, because its method professes to be strictly scientific. It is true that I cannot conceive four dimensions in space, and therefore, for me, the whole affair is unreal. But I have known men of great intellectual powers who seemed to have no difficulty either in conceiving them, or, at any rate, in imagining how they could conceive them; and, therefore, four-dimensioned geometry comes under my notion of science. So I think astrology is a science, in so far as it professes to reason logically from principles established by just inductive methods. To prevent misunderstanding, perhaps I had better add that I do not believe one whit in astrology; but no more do I believe in Ptolemaic astronomy, or in the catastrophic

geology of my youth, although these, in their day, claimed—and, to my mind, rightly claimed—the name of science. If nothing is to be called science but that which is exactly true from beginning to end, I am afraid there is very little science in the world outside mathematics. Among the physical sciences, I do not know that any could claim more than that it is true within certain limits, so narrow that, for the present at any rate, they may be neglected. If such is the case, I do not see where the line is to be drawn between exactly true, partially true, and mainly untrue forms of science. And what I have said about the current theology at the end of my paper [*supra* pp. 160–163] leaves, I think, no doubt as to the category in which I rank it. For all that, I think it would be not only unjust, but almost impertinent, to refuse the name of science to the "Summa" of St. Thomas or to the "Institutes" of Calvin.

In conclusion, I confess that my supposed "unjaded appetite" for the sort of controversy in which it needed not Mr. Gladstone's express declaration to tell us he is far better practised than I am (though probably, without another express declaration, no one would have suspected that his controversial fires are burning low) is already satiated.

In "Elysium" we conduct scientific discussions in a different medium, and we are liable to threat-

enings of asphyxia in that "atmosphere of contention" in which Mr. Gladstone has been able to live, alert and vigorous beyond the common race of men, as if it were purest mountain air. I trust that he may long continue to seek truth, under the difficult conditions he has chosen for the search, with unabated energy—I had almost said fire—

> May age not wither him, nor custom stale
> His infinite variety.

But Elysium suits my less robust constitution better, and I beg leave to retire thither, not sorry for my experience of the other region—no one should regret experience—but determined not to repeat it, at any rate in reference to the "plea for revelation."

Note on the Proper Sense of the "Mosaic" Narrative of the Creation.

It has been objected to my argument from Leviticus (*suprà* p. 170) that the Hebrew words translated by "creeping things" in Genesis i. 24 and Leviticus xi. 29, are different; namely, "reh-mes" in the former, "sheh-retz" in the latter. The obvious reply to this objection is that the question is not one of words but of the meaning of words. To borrow an illustration from our own language, if "crawling things" had been used by the translators in Genesis and "creeping things" in Leviticus, it would not have been necessarily implied that they intended to denote different groups of animals. "Sheh-retz" is employed in a wider sense than "reh-mes." There are "sheh-retz" of the

waters of the earth, of the air, and of the land. Leviticus speaks of land reptiles, among other animals, as "sheh-retz"; Genesis speaks of all creeping land animals, among which land reptiles are necessarily included, as "reh-mes." Our translators, therefore, have given the true sense when they render both "sheh-retz" and "reh-mes" by "creeping things."

Having taken a good deal of trouble to show what Genesis i.-ii. 4 does not mean, in the preceding pages, perhaps it may be well that I should briefly give my opinion as to what it does mean. I conceive that the unknown author of this part of the Hexateuchal compilation believed, and meant his readers to believe, that his words, as they understood them—that is to say, in their ordinary natural sense—conveyed the "actual historical truth." When he says that such and such things happened, I believe him to mean that they actually occurred and not that he imagined or dreamed them; when he says "day," I believe he uses the word in the popular sense; when he says "made" or "created," I believe he means that they came into being by a process analogous to that which the people whom he addressed called "making" or "creating"; and I think that, unless we forget our present knowledge of nature, and, putting ourselves back into the position of a Phœnician or a Chaldæan philosopher, start from his conception of the world, we shall fail to grasp the meaning of the Hebrew writer. We must conceive the earth to be an immovable, more or less flattened, body, with the vault of heaven above, the watery abyss below and around. We must imagine sun, moon, and stars to be "set" in a "firmament" with, or in, which they move; and above which is yet another watery mass. We must consider "light" and "darkness" to be things, the alternation of which constitutes day and night, independently of the existence of sun, moon, and stars. We must further suppose that, as in the case of the story of the deluge, the Hebrew writer was acquainted with a Gentile (probably Chaldæan or Accadian) account of the origin of things, in which he substantially believed, but which he stripped of all its idolatrous associations by substituting "Elohim" for Ea, Anu, Bel, and the like.

From this point of view the first verse strikes the keynote

of the whole. In the beginning "Elohim[1] created the heaven and the earth." Heaven and earth were not primitive existences from which the gods proceeded, as the Gentiles taught; on the contrary, the "Powers" preceded and created heaven and earth. Whether by "creation" is meant "causing to be where nothing was before" or "shaping of something which pre-existed," seems to me to be an insoluble question.

As I have pointed out, the second verse has an interesting parallel in Jeremiah iv. 23: "I beheld the earth, and, lo, it was waste and void; and the heavens, and they had no light." I conceive that there is no more allusion to chaos in the one than in the other. The earth-disk lay in its watery envelope, like the yolk of an egg in the *glaire*, and the spirit, or breath, of Elohim stirred the mass. Light was created as a thing by itself; and its antithesis "darkness" as another thing. It was supposed to be the nature of these two to alternate, and a pair of alternations constituted a "day" in the sense of an unit of time.

The next step was, necessarily, the formation of that "firmament," or dome over the earth-disk, which was supposed to support the celestial waters; and in which sun, moon, and stars were conceived to be set, as in a sort of orrery. The earth was still surrounded and covered by the lower waters, but the upper were separated from it by the "firmament," beneath which what we call the air lay. A second alternation of darkness and light marks the lapse of time.

After this, the waters which covered the earth-disk, under the firmament, were drawn away into certain regions, which became seas, while the part laid bare became dry land. In accordance with the notion, universally accepted in antiquity, that moist earth possesses the potentiality of giving rise to living beings, the land, at the command of Elohim, "put forth" all sorts of plants. They are made to appear thus early, not, I apprehend, from any notion that plants are lower in the scale of being than animals (which would seem to be inconsistent with the prevalence of tree worship among ancient people), but rather because

[1] For the sense of the term "Elohim," see the essay entitled "The Evolution of Theology" at the end of this volume.

animals obviously depend on plants ; and because, without crops and harvests, there seemed to be no particular need of heavenly signs for the seasons.

These were provided by the fourth day's work. Light existed already ; but now vehicles for the distribution of light, in a special manner and with varying degrees of intensity, were provided. I conceive that the previous alternations of light and darkness were supposed to go on ; but that the "light" was strengthened during the daytime by the sun, which, as a source of heat as well as of light, glided up the firmament from the east, and slid down in the west, each day. Very probably each day's sun was supposed to be a new one. And as the light of the day was strengthened by the sun, so the darkness of the night was weakened by the moon, which regularly waxed and waned every month. The stars are, as it were, thrown in. And nothing can more sharply mark the doctrinal purpose of the author, than the manner in which he deals with the heavenly bodies, which the Gentiles identified so closely with their gods, as if they were mere accessories to the almanac.

Animals come next in order of creation, and the general notion of the writer seems to be that they were produced by the medium in which they live ; that is to say, the aquatic animals by the waters, and the terrestrial animals by the land. But there was a difficulty about flying things, such as bats, birds, and insects. The cosmogonist seems to have had no conception of "air" as an elemental body. His "elements" are earth and water, and he ignores air as much as he does fire. Birds "fly above the earth in the open firmament" or "on the face of the expanse" of heaven. They are not said to fly through the air. The choice of a generative medium for flying things, therefore, seemed to lie between water and earth ; and, if we take into account the conspicuousness of the great flocks of water-birds and the swarms of winged insects, which appear to arise from water, I think the preference of water becomes intelligible. However, I do not put this forward as more than a probable hypothesis. As to the creation of aquatic animals on the fifth, that of land animals on the sixth day, and that of man last of all, I presume the order was determined by the fact that man

could hardly receive dominion over the living world before it existed ; and that the "cattle" were not wanted until he was about to make his appearance. The other terrestrial animals would naturally be associated with the cattle.

The absurdity of imagining that any conception, analogous to that of a zoological classification, was in the mind of the writer will be apparent, when we consider that the fifth day's work must include the zoologist's *Cetacea*, *Sirenia*, and seals,[1] all of which are *Mammalia ;* all birds, turtles, sea-snakes and, presumably, the fresh water *Reptilia* and *Amphibia ;* with the great majority of *Invertebrata.*

The creation of man is announced as a separate act, resulting from a particular resolution of Elohim to "make man in our image, after our likeness." To learn what this remarkable phrase means we must turn to the fifth chapter of Genesis, the work of the same writer. "In the day that Elohim created man, in the likeness of Elohim made he him ; male and female created he them ; and blessed them and called their name Adam in the day when they were created. And Adam lived an hundred and thirty years and begat *a son* in his own likeness, after his image ; and called his name Seth." I find it impossible to read this passage without being convinced that, when the writer says Adam was made in the likeness of Elohim, he means the same sort of likeness as when he says that Seth was begotten in the likeness of Adam. Whence it follows that his conception of Elohim was completely anthropomorphic.

In all this narrative I can discover nothing which differentiates it, in principle, from other ancient cosmogonies, except the rejection of all gods, save the vague, yet anthropomorphic, Elohim, and the assigning to them anteriority and superiority to the world. It is as utterly irreconcilable with the assured truths of modern science, as it is with the account of the origin of man, plants, and animals given by the writer of the second chief constituent of the Hexateuch in the second chapter of Genesis. This extraordinary story starts with the assumption of the existence of a rainless earth, devoid of plants and herbs

[1] Perhaps even hippopotamuses and otters !

of the field. The creation of living beings begins with that of a solitary man; the next thing that happens is the laying out of the Garden of Eden, and the causing the growth from its soil of every tree "that is pleasant to the sight and good for food"; the third act is the formation out of the ground of "every beast of the field, and every fowl of the air"; the fourth and last, the manufacture of the first woman from a rib, extracted from Adam, while in a state of anæsthesia.

Yet there are people who not only profess to take this monstrous legend seriously, but who declare it to be reconcilable with the Elohistic account of the creation!

VI

THE LIGHTS OF THE CHURCH AND THE LIGHT OF SCIENCE.

[1890]

THERE are three ways of regarding any account of past occurrences, whether delivered to us orally or recorded in writing.

The narrative may be exactly true. That is to say, the words, taken in their natural sense, and interpreted according to the rules of grammar, may convey to the mind of the hearer, or of the reader an idea precisely correspondent with one which would have remained in the mind of a witness. For example, the statement that King Charles the First was beheaded at Whitehall on the 30th day of January 1649, is as exactly true as any proposition in mathematics or physics; no one doubts that any person of sound faculties, properly placed, who was present at Whitehall throughout that day, and who used his eyes, would have seen the

King's head cut off; and that there would have remained in his mind an idea of that occurrence which he would have put into words of the same value as those which we use to express it.

Or the narrative may be partly true and partly false. Thus, some histories of the time tell us what the King said, and what Bishop Juxon said; or report royalist conspiracies to effect a rescue; or detail the motives which induced the chiefs of the Commonwealth to resolve that the King should die. One account declares that the King knelt at a high block, another that he lay down with his neck on a mere plank. And there are contemporary pictorial representations of both these modes of procedure. Such narratives, while veracious as to the main event, may and do exhibit various degrees of unconscious and conscious misrepresentation, suppression, and invention, till they become hardly distinguishable from pure fictions. Thus, they present a transition to narratives of a third class, in which the fictitious element predominates. Here, again, there are all imaginable gradations, from such works as Defoe's quasi-historical account of the Plague year, which probably gives a truer conception of that dreadful time than any authentic history, through the historical novel, drama, and epic, to the purely phantasmal creations of imaginative genius, such as the old "Arabian Nights" or the modern "Shaving of Shagpat." It is not strictly needful for my present

purpose that I should say anything about narratives which are professedly fictitious. Yet it may be well, perhaps, if I disclaim any intention of derogating from their value, when I insist upon the paramount necessity of recollecting that there is no sort of relation between the ethical, or the æsthetic, or even the scientific importance of such works, and their worth as historical documents. Unquestionably, to the poetic artist, or even to the student of psychology, "Hamlet" and "Macbeth" may be better instructors than all the books of a wilderness of professors of æsthetics or of moral philosophy. But, as evidence of occurrences in Denmark, or in Scotland, at the times and places indicated, they are out of court; the profoundest admiration for them, the deepest gratitude for their influence, are consistent with the knowledge that, historically speaking, they are worthless fables, in which any foundation of reality that may exist is submerged beneath the imaginative superstructure.

At present, however, I am not concerned to dwell upon the importance of fictitious literature and the immensity of the work which it has effected in the education of the human race. I propose to deal with the much more limited inquiry: Are there two other classes of consecutive narratives (as distinct from statements of individual facts), or only one? Is there any known historical work which is throughout exactly true, or is there not? In the case of the great majority

of histories the answer is not doubtful: they are all only partially true. Even those venerable works which bear the names of some of the greatest of ancient Greek and Roman writers, and which have been accepted by generation after generation, down to modern times, as stores of unquestionable truth, have been compelled by scientific criticism, after a long battle, to descend to the common level, and to confess to a large admixture of error. I might fairly take this for granted; but it may be well that I should entrench myself behind the very apposite words of a historical authority who is certainly not obnoxious to even a suspicion of sceptical tendencies.

> Time was—and that not very long ago—when all the relations of ancient authors concerning the old world were received with a ready belief; and an unreasoning and uncritical faith accepted with equal satisfaction the narrative of the campaigns of Cæsar and of the doings of Romulus, the account of Alexander's marches and of the conquests of Semiramis. We can most of us remember when, in this country, the whole story of regal Rome, and even the legend of the Trojan settlement in Latium, were seriously placed before boys as history, and discoursed of as unhesitatingly and in as dogmatic a tone as the tale of the Catiline Conspiracy or the Conquest of Britain. . .
>
> But all this is now changed. The last century has seen the birth and growth of a new science—the Science of Historical Criticism. . . . The whole world of profane history has been revolutionised. . . .[1]

[1] *Bampton Lectures* (1859), on "The Historical Evidences of the Truth of the Scripture Records stated anew, with Special Reference to the Doubts and Discoveries of Modern Times," by the Rev. G. Rawlinson, M.A., pp. 5–6.

If these utterances were true when they fell from the lips of a Bampton lecturer in 1859, with how much greater force do they appeal to us now, when the immense labours of the generation now passing away constitute one vast illustration of the power and fruitfulness of scientific methods of investigation in history, no less than in all other departments of knowledge.

At the present time, I suppose, there is no one who doubts that histories which appertain to any other people than the Jews, and their spiritual progeny in the first century, fall within the second class of the three enumerated. Like Goethe's Autobiography, they might all be entitled "Wahrheit und Dichtung"—"Truth and Fiction." The proportion of the two constituents changes indefinitely; and the quality of the fiction varies through the whole gamut of unveracity. But "Dichtung" is always there. For the most acute and learned of historians cannot remedy the imperfections of his sources of information; nor can the most impartial wholly escape the influence of the "personal equation" generated by his temperament and by his education. Therefore, from the narratives of Herodotus to those set forth in yesterday's "Times," all history is to be read subject to the warning that fiction has its share therein. The modern vast development of fugitive literature cannot be the unmitigated evil that some do vainly say it is, since it has put an end to the popular delusion of

less press-ridden times, that what appears in print must be true. We should rather hope that some beneficent influence may create among the erudite a like healthy suspicion of manuscripts and inscriptions, however ancient; for a bulletin may lie, even though it be written in cuneiform characters. Hotspur's starling, that was to be taught to speak nothing but "Mortimer" into the ears of King Henry the Fourth, might be a useful inmate of every historian's library, if "Fiction" were substituted for the name of Harry Percy's friend.

But it was the chief object of the lecturer to the congregation gathered in St. Mary's, Oxford, thirty-one years ago, to prove to them, by evidence gathered with no little labour and marshalled with much skill, that one group of historical works was exempt from the general rule; and that the narratives contained in the canonical Scriptures are free from any admixture of error. With justice and candour, the lecturer impresses upon his hearers that the special distinction of Christianity, among the religions of the world, lies in its claim to be historical; to be surely founded upon events which have happened, exactly as they are declared to have happened in its sacred books; which are true, that is, in the sense that the statement about the execution of Charles the First is true. Further, it is affirmed that the New Testament presupposes the historical exactness of the Old

Testament; that the points of contact of "sacred" and "profane" history are innumerable; and that the demonstration of the falsity of the Hebrew records, especially in regard to those narratives which are assumed to be true in the New Testament, would be fatal to Christian theology.

My utmost ingenuity does not enable me to discover a flaw in the argument thus briefly summarised. I am fairly at a loss to comprehend how any one, for a moment, can doubt that Christian theology must stand or fall with the historical trustworthiness of the Jewish Scriptures. The very conception of the Messiah, or Christ, is inextricably interwoven with Jewish history; the identification of Jesus of Nazareth with that Messiah rests upon the interpretation of passages of the Hebrew Scriptures which have no evidential value unless they possess the historical character assigned to them. If the covenant with Abraham was not made; if circumcision and sacrifices were not ordained by Jahveh; if the "ten words" were not written by God's hand on the stone tables; if Abraham is more or less a mythical hero, such as Theseus; the story of the Deluge a fiction; that of the Fall a legend; and that of the Creation the dream of a seer; if all these definite and detailed narratives of apparently real events have no more value as history than have the stories of the regal period

of Rome—what is to be said about the Messianic doctrine, which is so much less clearly enunciated? And what about the authority of the writers of the books of the New Testament, who, on this theory, have not merely accepted flimsy fictions for solid truths, but have built the very foundations of Christian dogma upon legendary quicksands?

But these may be said to be merely the carpings of that carnal reason which the profane call common sense; I hasten, therefore, to bring up the forces of unimpeachable ecclesiastical authority in support of my position. In a sermon preached last December, in St. Paul's Cathedral,[1] Canon Liddon declares:—

> For Christians it will be enough to know that our Lord Jesus Christ set the seal of His infallible sanction on the whole of the Old Testament. He found the Hebrew Canon as we have it in our hands to-day, and He treated it as an authority which was above discussion. Nay more: He went out of His way—if we may reverently speak thus—to sanction not a few portions of it which modern scepticism rejects. When He would warn His hearers against the dangers of spiritual relapse, He bids them remember "Lot's wife."[2] When He would point out how worldly engagements may blind the soul to a coming judgment, He reminds them how men ate, and drank, and married, and were given in marriage, until the day that Noah entered into

[1] *The Worth of the Old Testament*, a Sermon preached in St. Paul's Cathedral on the Second Sunday in Advent, 8th Dec., 1889, by H. P. Liddon, D.D., D.C.L., Canon and Chancellor of St. Paul's. Second edition, revised and with a new preface, 1890.

[2] St. Luke xvii. 32.

the ark, and the Flood came and destroyed them all.[1] If He would put His finger on a fact in past Jewish history which, by its admitted reality, would warrant belief in His own coming Resurrection, He points to Jonah's being three days and three nights in the whale's belly (p. 23).[2]

The preacher proceeds to brush aside the common—I had almost said vulgar—apologetic pretext that Jesus was using *ad hominem* arguments, or "accommodating" his better knowledge to popular ignorance, as well as to point out the inadmissibility of the other alternative, that he shared the popular ignorance. And to those who hold the latter view sarcasm is dealt out with no niggard hand.

But they will find it difficult to persuade mankind that, if He could be mistaken on a matter of such strictly religious importance as the value of the sacred literature of His countrymen, He can be safely trusted about anything else. The trustworthiness of the Old Testament is, in fact, inseparable from the trustworthiness of our Lord Jesus Christ ; and if we believe that He is the true Light of the world, we shall close our ears against suggestions impairing the credit of those Jewish Scriptures which have received the stamp of His Divine authority (p. 25).

Moreover, I learn from the public journals that a brilliant and sharply-cut view of orthodoxy, of like hue and pattern, was only the other day exhibited in that great theological kaleidoscope, the pulpit of St. Mary's, recalling the time so long passed by, when a Bampton lecturer, in the

[1] St. Luke xvii. 27. [2] St. Matt. xii. 40.

same place, performed the unusual feat of leaving the faith of old-fashioned Christians undisturbed.

Yet many things have happened in the intervening thirty-one years. The Bampton lecturer of 1859 had to grapple only with the infant Hercules of historical criticism; and he is now a full-grown athlete, bearing on his shoulders the spoils of all the lions that have stood in his path. Surely a martyr's courage, as well as a martyr's faith, is needed by any one who, at this time, is prepared to stand by the following plea for the veracity of the Pentateuch:—

> Adam, according to the Hebrew original, was for 243 years contemporary with Methuselah, who conversed for a hundred years with Shem. Shem was for fifty years contemporary with Jacob, who probably saw Jochebed, Moses's mother. Thus, Moses might by oral tradition have obtained the history of Abraham, and even of the Deluge, at third hand; and that of the Temptation and the Fall at fifth hand. . . .
>
> If it be granted—as it seems to be—that the great and stirring events in a nation's life will, under ordinary circumstances, be remembered (apart from all written memorials) for the space of 150 years, being handed down through five generations, it must be allowed (even on mere human grounds) that the account which Moses gives of the Temptation and the Fall is to be depended upon, if it passed through no more than four hands between him and Adam.[1]

If "the trustworthiness of our Lord Jesus Christ" is to stand or fall with the belief in the sudden transmutation of the chemical components of a woman's body into sodium chloride, or on the

[1] *Bampton Lectures*, 1859, pp. 50-51.

"admitted reality" of Jonah's ejection, safe and sound, on the shores of the Levant, after three days' sea-journey in the stomach of a gigantic marine animal, what possible pretext can there be for even hinting a doubt as to the precise truth of the longevity attributed to the Patriarchs? Who that has swallowed the camel of Jonah's journey will be guilty of the affectation of straining at such a historical gnat—nay, midge—as the supposition that the mother of Moses was told the story of the Flood by Jacob; who had it straight from Shem; who was on friendly terms with Methuselah; who knew Adam quite well?

Yet, by the strange irony of things, the illustrious brother of the divine who propounded this remarkable theory, has been the guide and foremost worker of that band of investigators of the records of Assyria and of Babylonia, who have opened to our view, not merely a new chapter, but a new volume of primeval history, relating to the very people who have the most numerous points of contact with the life of the ancient Hebrews. Now, whatever imperfections may yet obscure the full value of the Mesopotamian records, everything that has been clearly ascertained tends to the conclusion that the assignment of no more than 4000 years to the period between the time of the origin of mankind and that of Augustus Cæsar, is wholly inadmissible. Therefore the Biblical chronology, which Canon

Rawlinson trusted so implicitly in 1859, is relegated by all serious critics to the domain of fable.

But if scientific method, operating in the region of history, of philology, of archæology, in the course of the last thirty or forty years, has become thus formidable to the theological dogmatist, what may not be said about scientific method working in the province of physical science? For, if it be true that the Canonical Scriptures have innumerable points of contact with civil history, it is no less true that they have almost as many with natural history; and their accuracy is put to the test as severely by the latter as by the former. The origin of the present state of the heavens and the earth is a problem which lies strictly within the province of physical science; so is that of the origin of man among living things; so is that of the physical changes which the earth has undergone since the origin of man; so is that of the origin of the various races and nations of men, with all their varieties of language and physical conformation. Whether the earth moves round the sun or the contrary; whether the bodily and mental diseases of men and animals are caused by evil spirits or not; whether there is such an agency as witchcraft or not—all these are purely scientific questions; and to all of them the Canonical Scriptures profess to give true answers. And though

nothing is more common than the assumption that these books come into conflict only with the speculative part of modern physical science, no assumption can have less foundation.

The antagonism between natural knowledge and the Pentateuch would be as great if the speculations of our time had never been heard of. It arises out of contradiction upon matters of fact. The books of ecclesiastical authority declare that certain events happened in a certain fashion; the books of scientific authority say they did not. As it seems that this unquestionable truth has not yet penetrated among many of those who speak and write on these subjects, it may be useful to give a full illustration of it. And for that purpose I propose to deal, at some length, with the narrative of the Noachian Deluge given in Genesis.

The Bampton lecturer in 1859, and the Canon of St. Paul's in 1890, are in full agreement that this history is true, in the sense in which I have defined historical truth. The former is of opinion that the account attributed to Berosus records a tradition—

not drawn from the Hebrew record, much less the foundation of that record; yet coinciding with it in the most remarkable way. The Babylonian version is tricked out with a few extravagances, as the monstrous size of the vessel and the translation of Xisuthros; but otherwise it is the Hebrew history *down to its minutiæ* (p. 64).

Moreover, correcting Niebuhr, the Bampton lecturer points out that the narrative of Berosus implies the universality of the Flood.

> It is plain that the waters are represented as prevailing above the tops of the loftiest mountains in Armenia—a height which must have been seen to involve the submersion of all the countries with which the Babylonians were acquainted (p. 66).

I may remark, in passing, that many people think the size of Noah's ark "monstrous," considering the probable state of the art of shipbuilding only 1600 years after the origin of man; while others are so unreasonable as to inquire why the translation of Enoch is less an "extravagance" than that of Xisuthros. It is more important, however, to note that the universality of the Deluge is recognised, not merely as a part of the story, but as a necessary consequence of some of its details. The latest exponent of Anglican orthodoxy, as we have seen, insists upon the accuracy of the Pentateuchal history of the Flood in a still more forcible manner. It is cited as one of those very narratives to which the authority of the Founder of Christianity is pledged, and upon the accuracy of which "the trustworthiness of our Lord Jesus Christ" is staked, just as others have staked it upon the truth of the histories of demoniac possession in the Gospels.

Now, when those who put their trust in scientific methods of ascertaining the truth in the province of natural history find themselves

confronted and opposed, on their own ground, by ecclesiastical pretensions to better knowledge, it is, undoubtedly, most desirable for them to make sure that their conclusions, whatever they may be, are well founded. And, if they put aside the unauthorised interference with their business and relegate the Pentateuchal history to the region of pure fiction, they are bound to assure themselves that they do so because the plainest teachings of Nature (apart from all doubtful speculations) are irreconcilable with the assertions which they reject.

At the present time, it is difficult to persuade serious scientific inquirers to occupy themselves, in any way, with the Noachian Deluge. They look at you with a smile and a shrug, and say they have more important matters to attend to than mere antiquarianism. But it was not so in my youth. At that time, geologists and biologists could hardly follow to the end any path of inquiry without finding the way blocked by Noah and his ark, or by the first chapter of Genesis; and it was a serious matter, in this country at any rate, for a man to be suspected of doubting the literal truth of the Diluvial or any other Pentateuchal history. The fiftieth anniversary of the foundation of the Geological Club (in 1824) was, if I remember rightly, the last occasion on which the late Sir Charles Lyell spoke to even so small a public as the members of that body. Our veteran

leader lighted up once more; and, referring to the difficulties which beset his early efforts to create a rational science of geology, spoke, with his wonted clearness and vigour, of the social ostracism which pursued him after the publication of the "Principles of Geology," in 1830, on account of the obvious tendency of that noble work to discredit the Pentateuchal accounts of the Creation and the Deluge. If my younger contemporaries find this hard to believe, I may refer them to a grave book, "On the Doctrine of the Deluge," published eight years later, and dedicated by its author to his father, the then Archbishop of York. The first chapter refers to the treatment of the "Mosaic Deluge," by Dr. Buckland and Mr. Lyell, in the following terms:

> Their respect for revealed religion has prevented them from arraying themselves openly against the Scriptural account of it —much less do they deny its truth—but they are in a great hurry to escape from the consideration of it, and evidently concur in the opinion of Linnæus, that no proofs whatever of the Deluge are to be discovered in the structure of the earth (p. 1).

And after an attempt to reply to some of Lyell's arguments, which it would be cruel to reproduce, the writer continues:—

> When, therefore, upon such slender grounds, it is determined, in answer to those who insist upon its universality, that the Mosaic Deluge must be considered a preternatural event, far beyond the reach of philosophical inquiry; not only as to the causes employed to produce it, but as to the effects most likely

to result from it; that determination wears an aspect of scepticism, which, however much soever it may be unintentional in the mind of the writer, yet cannot but produce an evil impression on those who are already predisposed to carp and cavil at the evidences of Revelation (pp. 8-9).

The kindly and courteous writer of these curious passages is evidently unwilling to make the geologists the victims of general opprobrium by pressing the obvious consequences of their teaching home. One is therefore pained to think of the feelings with which, if he lived so long as to become acquainted with the "Dictionary of the Bible," he must have perused the article "Noah," written by a dignitary of the Church for that standard compendium and published in 1863. For the doctrine of the universality of the Deluge is therein altogether given up; and I permit myself to hope that a long criticism of the story from the point of view of natural science, with which, at the request of the learned theologian who wrote it, I supplied him, may, in some degree, have contributed towards this happy result.

Notwithstanding diligent search, I have been unable to discover that the universality of the Deluge has any defender left, at least among those who have so far mastered the rudiments of natural knowledge as to be able to appreciate the weight of evidence against it. For example, when I turned to the "Speaker's Bible," published under the sanction of high Anglican authority, I

found the following judicial and judicious deliverance, the skilful wording of which may adorn, but does not hide, the completeness of the surrender of the old teaching :—

> Without pronouncing too hastily on any fair inferences from the words of Scripture, we may reasonably say that their most natural interpretation is, that the whole race of man had become grievously corrupted since the faithful had intermingled with the ungodly ; that the inhabited world was consequently filled with violence, and that God had decreed to destroy all mankind except one single family ; that, therefore, all that portion of the earth, perhaps as yet a very small portion, into which mankind had spread was overwhelmed with water. The ark was ordained to save one faithful family ; and lest that family, on the subsidence of the waters, should find the whole country round them a desert, a pair of all the beasts of the land and of the fowls of the air were preserved along with them, and along with them went forth to replenish the now desolated continent. The words of Scripture (confirmed as they are by universal tradition) appear at least to mean as much as this. They do not necessarily mean more.[1]

In the third edition of Kitto's "Cyclopædia of Biblical Literature" (1876), the article "Deluge," written by my friend, the present distinguished head of the Geological Survey of Great Britain, extinguishes the universality doctrine as thoroughly as might be expected from its authorship ; and, since the writer of the article "Noah" refers his readers to that entitled "Deluge," it is to be supposed, notwithstanding his generally orthodox tone, that he does not dissent from its conclusions. Again, the writers in Herzog's "Real-Encyclopädie"

[1] *Commentary on Genesis*, by the Bishop of Ely, p. 77.

(Bd. X. 1882) and in Riehm's "Handwörterbuch" (1884)—both works with a conservative leaning—are on the same side; and Diestel,[1] in his full discussion of the subject, remorselessly rejects the universality doctrine. Even that staunch opponent of scientific rationalism—may I say rationality?—Zöckler,[2] flinches from a distinct defence of the thesis, any opposition to which, well within my recollection, was howled down by the orthodox as mere "infidelity." All that, in his sore straits, Dr. Zöckler is able to do, is to pronounce a faint commendation upon a particularly absurd attempt at reconciliation, which would make out the Noachian Deluge to be a catastrophe which occurred at the end of the Glacial Epoch. This hypothesis involves only the trifle of a physical revolution of which geology knows nothing; and which, if it secured the accuracy of the Pentateuchal writer about the fact of the Deluge, would leave the details of his account as irreconcilable with the truths of elementary physical science as ever. Thus I may be permitted to spare myself and my readers the weariness of a recapitulation of the overwhelming arguments against the universality of the Deluge, which they will now find for themselves stated, as fully and forcibly as could be wished, by Anglican and other theologians, whose orthodoxy and conservative tend-

[1] *Die Sintflut*, 1876.
[2] *Theologie und Naturwissenschaft*, ii. 784-791 (1877).

encies have, hitherto, been above suspicion. Yet many fully admit (and, indeed, nothing can be plainer) that the Pentateuchal narrator means to convey that, as a matter of fact, the whole earth known to him was inundated; nor is it less obvious that unless all mankind, with the exception of Noah and his family, were actually destroyed, the references to the Flood in the New Testament are unintelligible.

But I am quite aware that the strength of the demonstration that no universal Deluge ever took place has produced a change of front in the army of apologetic writers. They have imagined that the substitution of the adjective "partial" for "universal," will save the credit of the Pentateuch, and permit them, after all, without too many blushes, to declare that the progress of modern science only strengthens the authority of Moses. Nowhere have I found the case of the advocates of this method of escaping from the difficulties of the actual position better put than in the lecture of Professor Diestel to which I have referred. After frankly admitting that the old doctrine of universality involves physical impossibilities, he continues:—

> All these difficulties fall away as soon as we give up the universality of the Deluge, and imagine a *partial* flooding of the earth, say in western Asia. But have we a right to do so? The narrative speaks of "the whole earth." But what is the meaning of this expression? Surely not the whole surface of

the earth according to the ideas of *modern* geographers, but, at most, according to the conceptions of the Biblical author. This very simple conclusion, however, is never drawn by too many readers of the Bible. But one need only cast one's eyes over the tenth chapter of Genesis in order to become acquainted with the geographical horizon of the Jews. In the north it was bounded by the Black Sea and the mountains of Armenia; extended towards the east very little beyond the Tigris; hardly reached the apex of the Persian Gulf; passed, then, through the middle of Arabia and the Red Sea; went southward through Abyssinia, and then turned westward by the frontiers of Egypt, and inclosed the easternmost islands of the Mediterranean (p 11).

The justice of this observation must be admitted, no less than the further remark that, in still earlier times, the pastoral Hebrews very probably had yet more restricted notions of what constituted the "whole earth." Moreover, I, for one, fully agree with Professor Diestel that the motive, or generative incident, of the whole story is to be sought in the occasionally excessive and desolating floods of the Euphrates and the Tigris.

Let us, provisionally, accept the theory of a partial deluge, and try to form a clear mental picture of the occurrence. Let us suppose that, for forty days and forty nights, such a vast quantity of water was poured upon the ground that the whole surface of Mesopotamia was covered by water to a depth certainly greater, probably much greater, than fifteen cubits, or twenty feet (Gen. vii. 20). The inundation prevails upon the earth for one hundred and fifty days; and then the flood gradually decreases, until, on the seven-

teenth day of the seventh month, the ark, which had previously floated on its surface, grounds upon the "mountains of Ararat"[1] (Gen. viii. 34). Then, as Diestel has acutely pointed out ("Sintflut," p. 13), we are to imagine the further subsidence of the flood to take place so gradually that it was not until nearly two months and a-half after this time (that is to say, on the first day of the tenth month) that the "tops of the mountains" became visible. Hence it follows that, if the ark drew even as much as twenty feet of water, the level of the inundation fell very slowly —at a rate of only a few inches a day—until the top of the mountain on which it rested became visible. This is an amount of movement which, if it took place in the sea, would be overlooked by ordinary people on the shore. But the Mesopotamian plain slopes gently, from an elevation of 500 or 600 feet at its northern end, to the sea, at its southern end, with hardly so much as a notable ridge to break its uniform flatness, for 300 to 400 miles. These being the conditions of the case, the following inquiry naturally presents itself: not, be it observed, as a recondite problem, generated by modern speculation, but as a plain suggestion flowing out of that very ordinary and archaic piece of knowledge that water cannot be

[1] It is very doubtful if this means the region of the Armenian Ararat. More probably it designates some part either of the Kurdish range or of its south-eastern continuation.

piled up in a heap, like sand; or that it seeks the lowest level. When, after 150 days, "the fountains also of the deep and the windows of heaven were stopped, and the rain from heaven was restrained" (Gen. viii. 2), what prevented the mass of water, several, possibly very many, fathoms deep, which covered, say, the present site of Bagdad, from sweeping seaward in a furious torrent; and, in a very few hours, leaving, not only the "tops of the mountains," but the whole plain, save any minor depressions, bare? How could its subsidence, by any possibility, be an affair of weeks and months?

And if this difficulty is not enough, let any one try to imagine how a mass of water several, perhaps very many, fathoms deep, could be accumulated on a flat surface of land rising well above the sea, and separated from it by no sort of barrier. Most people know Lord's Cricket-ground. Would it not be an absurd contradiction to our common knowledge of the properties of water to imagine that, if all the mains of all the waterworks of London were turned on to it, they could maintain a heap of water twenty feet deep over its level surface? Is it not obvious that the water, whatever momentary accumulation might take place at first, would not stop there, but that it would dash, like a mighty mill-race, southwards down the gentle slope which ends in the Thames? And is it not further obvious, that whatever

depth of water might be maintained over the cricket-ground so long as all the mains poured on to it, anything which floated there would be speedily whirled away by the current, like a cork in a gutter when the rain pours? But if this is so, then it is no less certain that Noah's deeply laden, sailless, oarless, and rudderless craft, if by good fortune it escaped capsizing in whirlpools, or having its bottom knocked into holes by snags (like those which prove fatal even to well-built steamers on the Mississippi in our day), would have speedily found itself a good way down the Persian Gulf, and not long after in the Indian Ocean, somewhere between Arabia and Hindostan. Even if, eventually, the ark might have gone ashore, with other jetsam and flotsam, on the coasts of Arabia, or of Hindostan, or of the Maldives, or of Madagascar, its return to the "mountains of Ararat" would have been a miracle more stupendous than all the rest.

Thus, the last state of the would-be reconcilers of the story of the Deluge with fact is worse than the first. All that they have done is to transfer the contradictions to established truth from the region of science proper to that of common information and common sense. For, really, the assertion that the surface of a body of deep water, to which no addition was made, and which there was nothing to stop from running into the sea, sank at the rate of only a few inches or even feet

a day, simply outrages the most ordinary and familiar teachings of every man's daily experience. A child may see the folly of it.

In addition, I may remark that the necessary assumption of the "partial Deluge" hypothesis (if it is confined to Mesopotamia) that the Hebrew writer must have meant low hills when he said "high mountains," is quite untenable. On the eastern side of the Mesopotamian plain, the snowy peaks of the frontier ranges of Persia are visible from Bagdad,[1] and even the most ignorant herdsmen in the neighbourhood of "Ur of the Chaldees," near its western limit, could hardly have been unacquainted with the comparatively elevated plateau of the Syrian desert which lay close at hand. But, surely, we must suppose the Biblical writer to be acquainted with the highlands of Palestine and with the masses of the Sinaitic peninsula, which soar more than 8000 feet above the sea, if he knew of no higher elevations; and, if so, he could not well have meant to refer to mere hillocks when he said that "all the high mountains which were under the whole heaven were covered" (Genesis vii. 19). Even the hill-country of Galilee reaches an elevation of 4000 feet; and a flood which covered it could by no possibility have been other than universal in its superficial extent. Water really cannot be got to stand at,

[1] So Reclus (*Nouvelle Géographie Universelle*, ix. 386), but I find the statement doubted by an authority of the first rank.

say, 4000 feet above the sea-level over Palestine, without covering the rest of the globe to the same height. Even if, in the course of Noah's six hundredth year, some prodigious convulsion had sunk the whole region inclosed within "the horizon of the geographical knowledge" of the Israelites by that much, and another had pushed it up again, just in time to catch the ark upon the "mountains of Ararat," matters are not much mended. I am afraid to think of what would have become of a vessel so little seaworthy as the ark and of its very numerous passengers, under the peculiar obstacles to quiet flotation which such rapid movements of depression and upheaval would have generated.

Thus, in view, not, I repeat, of the recondite speculations of infidel philosophers, but in the face of the plainest and most commonplace of ascertained physical facts, the story of the Noachian Deluge has no more claim to credit than has that of Deucalion; and whether it was, or was not, suggested by the familiar acquaintance of its originators with the effects of unusually great overflows of the Tigris and Euphrates, it is utterly devoid of historical truth.

That is, in my judgment, the necessary result of the application of criticism, based upon assured physical knowledge, to the story of the Deluge. And it is satisfactory that the criticism which is

based, not upon literary and historical speculations, but upon well-ascertained facts in the departments of literature and history, tends to exactly the same conclusion.

For I find this much agreed upon by all Biblical scholars of repute, that the story of the Deluge in Genesis is separable into at least two sets of statements; and that, when the statements thus separated are recombined in their proper order, each set furnishes an account of the event, coherent and complete within itself, but in some respects discordant with that afforded by the other set. This fact, as I understand, is not disputed. Whether one of these is the work of an Elohist, and the other of a Jehovist narrator; whether the two have been pieced together in this strange fashion because, in the estimation of the compilers and editors of the Pentateuch, they had equal and independent authority, or not; or whether there is some other way of accounting for it—are questions the answers to which do not affect the fact. If possible I avoid *à priori* arguments. But still, I think it may be urged, without imprudence, that a narrative having this structure is hardly such as might be expected from a writer possessed of full and infallibly accurate knowledge. Once more, it would seem that it is not necessarily the mere inclination of the sceptical spirit to question everything, or the wilful blindness of infidels, which prompts grave doubts as to the

value of a narrative thus curiously unlike the ordinary run of veracious histories.

But the voice of archæological and historical criticism still has to be heard; and it gives forth no uncertain sound. The marvellous recovery of the records of an antiquity, far superior to any that can be ascribed to the Pentateuch, which has been effected by the decipherers of cuneiform characters, has put us in possession of a series, once more, not of speculations, but of facts, which have a most remarkable bearing upon the question of the trustworthiness of the narrative of the Flood. It is established, that for centuries before the asserted migration of Terah from Ur of the Chaldees (which, according to the orthodox interpreters of the Pentateuch, took place after the year 2000 B.C.) Lower Mesopotamia was the seat of a civilisation in which art and science and literature had attained a development formerly unsuspected, or, if there were faint reports of it, treated as fabulous. And it is also no matter of speculation, but a fact, that the libraries of these people contain versions of a long epic poem, one of the twelve books of which tells a story of a deluge, which, in a number of its leading features, corresponds with the story attributed to Berosus, no less than with the story given in Genesis, with curious exactness. Thus, the correctness of Canon Rawlinson's conclusion, cited above, that the story of Berosus was neither drawn from the Hebrew

record, nor is the foundation of it, can hardly be questioned. It is highly probable, if not certain, that Berosus relied upon one of the versions (for there seem to have been several) of the old Babylonian epos, extant in his time; and, if that is a reasonable conclusion, why is it unreasonable to believe that the two stories, which the Hebrew compiler has put together in such an inartistic fashion, were ultimately derived from the same source? I say ultimately, because it does not at all follow that the two versions, possibly trimmed by the Jehovistic writer on the one hand, and by the Elohistic on the other, to suit Hebrew requirements, may not have been current among the Israelites for ages. And they may have acquired great authority before they were combined in the Pentateuch.

Looking at the convergence of all these lines of evidence to the one conclusion—that the story of the Flood in Genesis is merely a Bowdlerised version of one of the oldest pieces of purely fictitious literature extant; that whether this is, or is not, its origin, the events asserted in it to have taken place assuredly never did take place; further, that, in point of fact, the story, in the plain and logically necessary sense of its words, has long since been given up by orthodox and conservative commentators of the Established Church—I can but admire the courage and clear foresight of the Anglican divine who tells us that

we must be prepared to choose between the trustworthiness of scientific method and the trustworthiness of that which the Church declares to be Divine authority. For, to my mind, this declaration of war to the knife against secular science, even in its most elementary form; this rejection, without a moment's hesitation, of any and all evidence which conflicts with theological dogma—is the only position which is logically reconcilable with the axioms of orthodoxy. If the Gospels truly report that which an incarnation of the God of Truth communicated to the world, then it surely is absurd to attend to any other evidence touching matters about which he made any clear statement, or the truth of which is distinctly implied by his words. If the exact historical truth of the Gospels is an axiom of Christianity, it is as just and right for a Christian to say, Let us "close our ears against suggestions" of scientific critics, as it is for the man of science to refuse to waste his time upon circle-squarers and flat-earth fanatics.

It is commonly reported that the manifesto by which the Canon of St. Paul's proclaims that he nails the colours of the straitest Biblical infallibility to the mast of the ship ecclesiastical, was put forth as a counterblast to "Lux Mundi"; and that the passages which I have more particularly quoted are directed against the essay on "The Holy Spirit and Inspiration" in that

collection of treatises by Anglican divines of high standing, who must assuredly be acquitted of conscious "infidel" proclivities. I fancy that rumour must, for once, be right, for it is impossible to imagine a more direct and diametrical contradiction than that between the passages from the sermon cited above and those which follow:—

> What is questioned is that our Lord's words foreclose certain critical positions as to the character of Old Testament literature. For example, does His use of Jonah's resurrection as a *type* of His own, depend in any real degree upon whether it is historical fact or allegory? . . . Once more, our Lord uses the time before the Flood, to illustrate the carelessness of men before His own coming. . . . In referring to the Flood He certainly suggests that He is treating it as typical, for He introduces circumstances—"eating and drinking, marrying and giving in marriage"—which have no counterpart in the original narrative (pp. 358-9).

While insisting on the flow of inspiration through the whole of the Old Testament, the essayist does not admit its universality. Here, also, the new apologetic demands a partial flood:

> But does the inspiration of the recorder guarantee the exact historical truth of what he records? And, in matter of fact, can the record, with due regard to legitimate historical criticism, be pronounced true? Now, to the latter of these two questions (and they are quite distinct questions) we may reply that there is nothing to prevent our believing, as our faith strongly disposes us to believe, that the record from Abraham downward is, in substance, in the strict sense historical (p. 351).

It would appear, therefore, that there is nothing to prevent our believing that the record, from

Abraham upward, consists of stories in the strict sense unhistorical, and that the pre-Abrahamic narratives are mere moral and religious "types" and parables.

I confess I soon lose my way when I try to follow those who walk delicately among "types" and allegories. A certain passion for clearness forces me to ask, bluntly, whether the writer means to say that Jesus did not believe the stories in question, or that he did? When Jesus spoke, as of a matter of fact, that "the Flood came and destroyed them all," did he believe that the Deluge really took place, or not? It seems to me that, as the narrative mentions Noah's wife, and his sons' wives, there is good scriptural warranty for the statement that the antediluvians married and were given in marriage; and I should have thought that their eating and drinking might be assumed by the firmest believer in the literal truth of the story. Moreover, I venture to ask what sort of value, as an illustration of God's methods of dealing with sin, has an account of an event that never happened? If no Flood swept the careless people away, how is the warning of more worth than the cry of "Wolf" when there is no wolf? If Jonah's three days' residence in the whale is not an "admitted reality," how could it "warrant belief" in the "coming resurrection?" If Lot's wife was not turned into a pillar of salt, the bidding

those who turn back from the narrow path to "remember" it is, morally, about on a level with telling a naughty child that a bogy is coming to fetch it away. Suppose that a Conservative orator warns his hearers to beware of great political and social changes, lest they end, as in France, in the domination of a Robespierre; what becomes, not only of his argument, but of his veracity, if he, personally, does not believe that Robespierre existed and did the deeds attributed to him?

Like all other attempts to reconcile the results of scientifically-conducted investigation with the demands of the outworn creeds of ecclesiasticism, the essay on Inspiration is just such a failure as must await mediation, when the mediator is unable properly to appreciate the weight of the evidence for the case of one of the two parties. The question of "Inspiration" really possesses no interest for those who have cast ecclesiasticism and all its works aside, and have no faith in any source of truth save that which is reached by the patient application of scientific methods. Theories of inspiration are speculations as to the means by which the authors of statements, in the Bible or elsewhere, have been led to say what they have said — and it assumes that natural agencies are insufficient for the purpose. I prefer to stop short of this problem, finding it more profitable to undertake the inquiry which

naturally precedes it—namely, Are these statements true or false? If they are true, it may be worth while to go into the question of their supernatural generation; if they are false, it certainly is not worth mine.

Now, not only do I hold it to be proven that the story of the Deluge is a pure fiction; but I have no hesitation in affirming the same thing of the story of the Creation.[1] Between these two lies the story of the creation of man and woman and their fall from primitive innocence, which is even more monstrously improbable than either of the other two, though, from the nature of the case, it is not so easily capable of direct refutation. It can be demonstrated that the earth took longer than six days in the making, and that the Deluge, as described, is a physical impossibility; but there is no proving, especially to those who are perfect in the art of closing their ears to that which they do not wish to hear, that a snake did not speak, or that Eve was not made out of one of Adam's ribs.

[1] So far as I know, the narrative of the Creation is not now held to be true, in the sense in which I have defined historical truth, by any of the reconcilers. As for the attempts to stretch the Pentateuchal days into periods of thousands or millions of years, the verdict of the eminent Biblical scholar, Dr. Riehm (*Der biblische Schöpfungsbericht*, 1881, pp. 15, 16), on such pranks of "Auslegungskunst" should be final. Why do the reconcilers take Goethe's advice seriously?—

> "Im Auslegen seyd frisch und munter!
> Legt ihr's nicht aus, so legt was unter."

The compiler of Genesis, in its present form, evidently had a definite plan in his mind. His countrymen, like all other men, were doubtless curious to know how the world began; how men, and especially wicked men, came into being, and how existing nations and races arose among the descendants of one stock; and, finally, what was the history of their own particular tribe. They, like ourselves, desired to solve the four great problems of cosmogeny, anthropogeny, ethnogeny, and geneogeny. The Pentateuch furnishes the solutions which appeared satisfactory to its author. One of these, as we have seen, was borrowed from a Babylonian fable; and I know of no reason to suspect any different origin for the rest. Now, I would ask, is the story of the fabrication of Eve to be regarded as one of those pre-Abrahamic narratives, the historical truth of which is an open question, in face of the reference to it in a speech unhappily famous for the legal oppression to which it has been wrongfully forced to lend itself?

Have ye not read, that he which made them from the beginning made them male and female, and said, For this cause shall a man leave his father and mother, and cleave to his wife; and the twain shall become one flesh? (Matt. xix. 5.)

If divine authority is not here claimed for the twenty-fourth verse of the second chapter of

Genesis, what is the value of language? And again, I ask, if one may play fast and loose with the story of the Fall as a "type" or "allegory," what becomes of the foundation of Pauline theology?—

> For since by man came death, by man came also the resurrection of the dead. For as in Adam all die, so also in Christ shall all be made alive (1 Corinthians xv. 21, 22).

If Adam may be held to be no more real a personage than Prometheus, and if the story of the Fall is merely an instructive "type," comparable to the profound Promethean mythus, what value has Paul's dialectic?

While, therefore, every right-minded man must sympathise with the efforts of those theologians, who have not been able altogether to close their ears to the still, small, voice of reason, to escape from the fetters which ecclesiasticism has forged; the melancholy fact remains, that the position they have taken up is hopelessly untenable. It is raked alike by the old-fashioned artillery of the Churches and by the fatal weapons of precision with which the *enfants perdus* of the advancing forces of science are armed. They must surrender, or fall back into a more sheltered position. And it is possible that they may long find safety in such retreat.

It is, indeed, probable that the proportional number of those who will distinctly profess their

belief in the transubstantiation of Lot's wife, and the anticipatory experience of submarine navigation by Jonah; in water standing fathoms deep on the side of a declivity without anything to hold it up; and in devils who enter swine—will not increase. But neither is there ground for much hope that the proportion of those who cast aside these fictions and adopt the consequence of that repudiation, are, for some generations, likely to constitute a majority. Our age is a day of compromises. The present and the near future seem given over to those happily, if curiously, constituted people who see as little difficulty in throwing aside any amount of post-Abrahamic Scriptural narrative, as the authors of "Lux Mundi" see in sacrificing the pre-Abrahamic stories; and, having distilled away every inconvenient matter of fact in Christian history, continue to pay divine honours to the residue. There really seems to be no reason why the next generation should not listen to a Bampton Lecture modelled upon that addressed to the last:—

> Time was—and that not very long ago—when all the relations of Biblical authors concerning the whole world were received with a ready belief; and an unreasoning and uncritical faith accepted with equal satisfaction the narrative of the Captivity and the doings of Moses at the court of Pharaoh, the account of the Apostolic meeting in the Epistle to the Galatians, and that of the fabrication of Eve. We can most of us remember when, in this country, the whole story of the Exodus, and even the legend of Jonah, were seriously placed before boys

as history, and discoursed of in as dogmatic a tone as the tale of Agincourt or the history of the Norman Conquest.

But all this is now changed. The last century has seen the growth of scientific criticism to its full strength. The whole world of history has been revolutionised and the mythology which embarrassed earnest Christians has vanished as an evil mist, the lifting of which has only more fully revealed the lineaments of infallible Truth. No longer in contact with fact of any kind, Faith stands now and for ever proudly inaccessible to the attacks of the infidel.

So far the apologist of the future. Why not? *Cantabit vacuus.*

VII

HASISADRA'S ADVENTURE

[1891]

SOME thousands of years ago there was a city in Mesopotamia called Surippak. One night a strange dream came to a dweller therein, whose name, if rightly reported, was Hasisadra. The dream foretold the speedy coming of a great flood; and it warned Hasisadra to lose no time in building a ship, in which, when notice was given, he, his family and friends, with their domestic animals and a collection of wild creatures and seed of plants of the land, might take refuge and be rescued from destruction. Hasisadra awoke, and at once acted upon the warning. A strong decked ship was built, and her sides were paid, inside and out, with the mineral pitch, or bitumen, with which the country abounded; the vessel's seaworthiness was tested, the cargo was stowed away, and a trusty pilot or steersman appointed.

The promised signal arrived. Wife and friends embarked; Hasisadra, following, prudently "shut the door," or, as we should say, put on the hatches; and Nes-Hea, the pilot, was left alone on deck to do his best for the ship. Thereupon a hurricane began to rage; rain fell in torrents; the subterranean waters burst forth; a deluge swept over the land, and the wind lashed it into waves sky high; heaven and earth became mingled in chaotic gloom. For six days and seven nights the gale raged, but the good ship held out until, on the seventh day, the storm lulled. Hasisadra ventured on deck; and, seeing nothing but a waste of waters strewed with floating corpses and wreck, wept over the destruction of his land and people. Far away, the mountains of Nizir were visible; the ship was steered for them and ran aground upon the higher land. Yet another seven days passed by. On the seventh, Hasisadra sent forth a dove, which found no resting place and returned; then he liberated a swallow, which also came back; finally, a raven was let loose, and that sagacious bird, when it found that the water had abated, came near the ship, but refused to return to it. Upon this, Hasisadra liberated the rest of the wild animals, which immediately dispersed in all directions, while he, with his family and friends, ascending a mountain hard by, offered sacrifice upon its summit to the gods.

The story thus given in summary abstract, told in an ancient Semitic dialect, is inscribed in cuneiform characters upon a tablet of burnt clay. Many thousands of such tablets, collected by Assurbanipal, King of Assyria in the middle of the seventh century B.C., were stored in the library of his palace at Nineveh; and, though in a sadly broken and mutilated condition, they have yielded a marvellous amount of information to the patient and sagacious labour which modern scholars have bestowed upon them. Among the multitude of documents of various kinds, this narrative of Hasisadra's adventure has been found in a tolerably complete state. But Assyriologists agree that it is only a copy of a much more ancient work; and there are weighty reasons for believing that the story of Hasisadra's flood was well known in Mesopotamia before the year 2000 B.C.

No doubt, then, we are in presence of a narrative which has all the authority which antiquity can confer; and it is proper to deal respectfully with it, even though it is quite as proper, and indeed necessary, to act no less respectfully towards ourselves; and, before professing to put implicit faith in it, to inquire what claim it has to be regarded as a serious account of an historical event.

It is of no use to appeal to contemporary history, although the annals of Babylonia, no less

than those of Egypt, go much further back than 2000 B.C. All that can be said is, that the former are hardly consistent with the supposition that any catastrophe, competent to destroy all the population, has befallen the land since civilisation began, and that the latter are notoriously silent about deluges. In such a case as this, however, the silence of history does not leave the inquirer wholly at fault. Natural science has something to say when the phenomena of nature are in question. Natural science may be able to show, from the nature of the country, either that such an event as that described in the story is impossible, or at any rate highly improbable; or, on the other hand, that it is consonant with probability. In the former case, the narrative must be suspected or rejected; in the latter, no such summary verdict can be given: on the contrary, it must be admitted that the story may be true. And then, if certain strangely prevalent canons of criticism are accepted, and if the evidence that an event might have happened is to be accepted as proof that it did happen, Assyriologists will be at liberty to congratulate one another on the "confirmation by modern science" of the authority of their ancient books.

It will be interesting, therefore, to inquire how far the physical structure and the other conditions of the region in which Surippak was situated are

compatible with such a flood as is described in the Assyrian record.

The scene of Hasisadra's adventure is laid in the broad valley, six or seven hundred miles long, and hardly anywhere less than a hundred miles in width, which is traversed by the lower courses of the rivers Euphrates and Tigris, and which is commonly known as the "Euphrates valley." Rising, at the one end, into a hill country, which gradually passes into the Alpine heights of Armenia; and, at the other, dipping beneath the shallow waters of the head of the Persian Gulf, which continues in the same direction, from north-west to south-east, for some eight hundred miles farther, the floor of the valley presents a gradual slope, from eight hundred feet above the sea level to the depths of the southern end of the Persian Gulf. The boundary between sea and land, formed by the extremest mudflats of the delta of the two rivers, is but vaguely defined; and, year by year, it advances seaward. On the north-eastern side, the western frontier ranges of Persia rise abruptly to great heights; on the south-western side, a more gradual ascent leads to a table-land of less elevation, which, very broad in the south, where it is occupied by the deserts of Arabia and of Southern Syria, narrows, northwards, into the highlands of Palestine, and is continued by the ranges of the Lebanon, the Antilebanon, and the Taurus, into the highlands of Armenia.

The wide and gently inclined plain, thus inclosed between the gulf and the highlands, on each side and at its upper extremity, is distinguishable into two regions of very different character, one of which lies north, and the other south of the parallel of Hit, on the Euphrates. Except in the immediate vicinity of the river, the northern division is stony and scantily covered with vegetation, except in spring. Over the southern division, on the contrary, spreads a deep alluvial soil, in which even a pebble is rare; and which, though, under the existing misrule, mainly a waste of marsh and wilderness, needs only intelligent attention to become, as it was of old, the granary of western Asia. Except in the extreme south, the rainfall is small and the air dry. The heat in summer is intense, while bitterly cold northern blasts sweep the plain in winter. Whirlwinds are not uncommon; and, in the intervals of the periodical inundations, the fine, dry, powdery soil is swept, even by moderate breezes, into stifling clouds, or rather fogs, of dust. Low inequalities, elevations here and depressions there, diversify the surface of the alluvial region. The latter are occupied by enormous marshes, while the former support the permanent dwellings of the present scanty and miserable population.

In antiquity, so long as the canalisation of the country was properly carried out, the fertility of the alluvial plain enabled great and prosperous nations to have their home in the Euphrates

valley. Its abundant clay furnished the materials for the masses of sun-dried and burnt bricks, the remains of which, in the shape of huge artificial mounds, still testify to both the magnitude and the industry of the population, thousands of years ago. Good cement is plentiful, while the bitumen, which wells from the rocks at Hit and elsewhere, not only answers the same purpose, but is used to this day, as it was in Hasisadra's time, to pay the inside and the outside of boats.

In the broad lower course of the Euphrates, the stream rarely acquires a velocity of more than three miles an hour, while the lower Tigris attains double that rate in times of flood. The water of both great rivers is mainly derived from the northern and eastern highlands in Armenia and in Kurdistan, and stands at its lowest level in early autumn and in January. But when the snows accumulated in the upper basins of the great rivers, during the winter, melt under the hot sunshine of spring, they rapidly rise,[1] and at length overflow their banks, covering the alluvial plain with a vast inland sea, interrupted only by the higher ridges and hummocks which form islands in a seemingly boundless expanse of water.

In the occurrence of these annual inundations

[1] In May 1849 the Tigris at Bagdad rose 22½ feet—5 feet above its usual rise—and nearly swept away the town. In 1831 a similarly exceptional flood did immense damage, destroying 7000 houses. See Loftus, *Chaldea and Susiana*, p. 7.

lies one of several resemblances between the valley of the Euphrates and that of the Nile. But there are important differences. The time of the annual flood is reversed, the Nile being highest in autumn and winter, and lowest in spring and early summer. The periodical overflows of the Nile, regulated by the great lake basins in the south, are usually punctual in arrival, gradual in growth, and beneficial in operation. No lakes are interposed between the mountain torrents of the upper basis of the Tigris and the Euphrates and their lower courses. Hence, heavy rain, or an unusually rapid thaw in the uplands, gives rise to the sudden irruption of a vast volume of water which not even the rapid Tigris, still less its more sluggish companion, can carry off in time to prevent violent and dangerous overflows. Without an elaborate system of canalisation, providing an escape for such sudden excesses of the supply of water, the annual floods of the Euphrates, and especially of the Tigris, must always be attended with risk, and often prove harmful.

There are other peculiarities of the Euphrates valley which may occasionally tend to exacerbate the evils attendant on the inundations. It is very subject to seismic disturbances; and the ordinary consequences of a sharp earthquake shock might be seriously complicated by its effect on a broad sheet of water. Moreover the Indian Ocean lies within the region of typhoons; and if, at the height

of an inundation, a hurricane from the south-east swept up the Persian Gulf, driving its shallow waters upon the delta and damming back the outflow, perhaps for hundreds of miles up-stream, a diluvial catastrophe, fairly up to the mark of Hasisadra's, might easily result.[1]

Thus there seems to be no valid reason for rejecting Hasisadra's story on physical grounds. I do not gather from the narrative that the "mountains of Nizir" were supposed to be submerged, but merely that they came into view above the distant horizon of the waters, as the vessel drove in that direction. Certainly the ship is not supposed to ground on any of their higher summits, for Hasisadra has to ascend a peak in order to offer his sacrifice. The country of Nizir lay on the north-eastern side of the Euphrates valley, about the courses of the two rivers Zab, which enter the Tigris where it traverses the plain of Assyria some eight or nine hundred feet above the sea; and, so far as I can judge from maps[2] and other sources of information, it is possible, under the circumstances supposed, that such a ship as Hasisadra's might drive before a

[1] See the instructive chapter on Hasisadra's flood in Suess, *Das Antlitz der Erde*, Abth. I. Only fifteen years ago a cyclone in the Bay of Bengal gave rise to a flood which covered 3000 square miles of the delta of the Ganges, 3 to 45 feet deep, destroying 100,000 people, innumerable cattle, houses, and trees. It broke inland, on the rising ground of Tipperah, and may have swept a vessel from the sea that far, though I do not know that it did.

[2] See Cernik's maps in *Petermanns Mittheilungen*, Ergänzungshefte 44 and 45, 1875-76.

southerly gale, over a continuously flooded country, until it grounded on some of the low hills between which both the lower and the upper Zab enter upon the Assyrian plain.

The tablet which contains the story under consideration is the eleventh of a series of twelve. Each of these answers to a month, and to the corresponding sign of the Zodiac. The Assyrian year began with the spring equinox; consequently, the eleventh month, called "the rainy," answers to our January-February, and to the sign which corresponds with our Aquarius. The aquatic adventure of Hasisadra, therefore, is not inappropriately placed. It is curious, however, that the season thus indirectly assigned to the flood is not that of the present highest level of the rivers. It is too late for the winter rise and too early for the spring floods.

I think it must be admitted that, so far, the physical cross-examination to which Hasisadra has been subjected does not break down his story. On the contrary, he proves to have kept it in all essential respects[1] within the bounds of probability or possibility. However, we have not yet done with him. For the conditions which obtained in the Euphrates valley, four or five thousand years

[1] I have not cited the dimensions given to the ships in most translations of the story, because there appears to be a doubt about them. Haupt (*Keilinschriftliche Sindfluth-Bericht*, p. 13) says that the figures are illegible.

ago, may have differed to such an extent from those which now exist that we should be able to convict him of having made up his tale. But here again everything is in favour of his credibility. Indeed, he may claim very powerful support, for it does not lie in the mouths of those who accept the authority of the Pentateuch to deny that the Euphrates valley was what it is, even six thousand years back. According to the book of Genesis, Phrat and Hiddekel—the Euphrates and the Tigris—are coeval with Paradise. An edition of the Scriptures, recently published under high authority, with an elaborate apparatus of "Helps" for the use of students—and therefore, as I am bound to suppose, purged of all statements that could by any possibility mislead the young—assigns the year B.C. 4004 as the date of Adam's too brief residence in that locality.

But I am far from depending on this authority for the age of the Mesopotamian plain. On the contrary, I venture to rely, with much more confidence, on another kind of evidence, which tends to show that the age of the great rivers must be carried back to a date earlier than that at which our ingenuous youth is instructed that the earth came into existence. For, the alluvial deposit having been brought down by the rivers, they must needs be older than the plain it forms, as navvies must needs antecede the embankment painfully built up by the contents of their wheel-

barrows. For thousands of years, heat and cold, rain, snow, and frost, the scrubbing of glaciers, and the scouring of torrents laden with sand and gravel, have been wearing down the rocks of the upper basins of the rivers, over an area of many thousand square miles; and these materials, ground to fine powder in the course of their long journey, have slowly subsided, as the water which carried them spread out and lost its velocity in the sea. It is because this process is still going on that the shore of the delta constantly encroaches on the head of the gulf[1] into which the two rivers are constantly throwing the waste of Armenia and of Kurdistan. Hence, as might be expected, fluviatile and marine shells are common in the alluvial deposit; and Loftus found strata, containing subfossil marine shells of species now living, in the Persian Gulf, at Warka, two hundred miles in a straight line from the shore of the delta.[2] It follows that, if a trustworthy estimate of the average rate of growth of the alluvial can be formed, the lowest limit (by no means the highest limit) of age of the rivers can be determined. All such estimates are beset with sources

[1] It is probable that a slow movement of elevation of the land at one time contributed to the result—perhaps does so still.

[2] At a comparatively recent period, the littoral margin of the Persian Gulf extended certainly 250 miles farther to the northwest than the present embouchure of the Shatt-el Arab. (Loftus, *Quarterly Journal of the Geological Society*, 1853, p. 251.) The actual extent of the marine deposit inland cannot be defined, as it is covered by later fluviatile deposits.

of error of very various kinds; and the best of them can only be regarded as approximations to the truth. But I think it will be quite safe to assume a maximum rate of growth of four miles in a century for the lower half of the alluvial plain.

Now, the cycle of narratives of which Hasisadra's adventure forms a part contains allusions not only to Surippak, the exact position of which is doubtful, but to other cities, such as Erech. The vast ruins at the present village of Warka have been carefully explored and determined to be all that remains of that once great and flourishing city, "Erech the lofty." Supposing that the two hundred miles of alluvial country, which separates them from the head of the Persian Gulf at present, have been deposited at the very high rate of four miles in a century, it will follow that 4000 years ago, or about the year 2100 B.C., the city of Erech still lay forty miles inland. Indeed, the city might have been built a thousand years earlier. Moreover, there is plenty of independent archæological and other evidence that in the whole thousand years, 2000 to 3000 B.C., the alluvial plain was inhabited by a numerous people, among whom industry, art, and literature had attained a very considerable development. And it can be shown that the physical conditions and the climate of the Euphrates valley, at that time, must have been extremely similar to what they are now.

Thus, once more, we reach the conclusion that, as a question of physical probability, there is no ground for objecting to the reality of Hasisadra's adventure. It would be unreasonable to doubt that such a flood might have happened, and that such a person might have escaped in the way described, any time during the last 5000 years. And if the postulate of loose thinkers in search of scientific "confirmations" of questionable narratives—proof that an event may have happened is evidence that it did happen—is to be accepted, surely Hasisadra's story is "confirmed by modern scientific investigation" beyond all cavil. However, it may be well to pause before adopting this conclusion, because the original story, of which I have set forth only the broad outlines, contains a great many statements which rest upon just the same foundation as those cited, and yet are hardly likely to meet with general acceptance. The account of the circumstances which led up to the flood, of those under which Hasisadra's adventure was made known to his descendant, of certain remarkable incidents before and after the flood, are inseparably bound up with the details already given. And I am unable to discover any justification for arbitrarily picking out some of these and dubbing them historical verities, while rejecting the rest as legendary fictions. They stand or fall together.

Before proceeding to the consideration of these

less satisfactory details, it is needful to remark that Hasisadra's adventure is a mere episode in a cycle of stories of which a personage, whose name is provisionally read "Izdubar," is the centre. The nature of Izdubar hovers vaguely between the heroic and the divine; sometimes he seems a mere man, sometimes approaches so closely to the divinities of fire and of the sun as to be hardly distinguishable from them. As I have already mentioned, the tablet which sets forth Hasisadra's perils is one of twelve; and, since each of these represents a month and bears a story appropriate to the corresponding sign of the Zodiac, great weight must be attached to Sir Henry Rawlinson's suggestion that the epos of Izdubar is a poetical embodiment of solar mythology.

In the earlier books of the epos, the hero, not content with rejecting the proffered love of the Chaldæan Aphrodite, Istar, freely expresses his very low estimate of her character; and it is interesting to observe that, even in this early stage of human experience, men had reached a conception of that law of nature which expresses the inevitable consequences of an imperfect appreciation of feminine charms. The injured goddess makes Izdubar's life a burden to him, until at last, sick in body and sorry in mind, he is driven to seek aid and comfort from his forbears in the world of spirits. So this antitype of Odysseus journeys to the shore of the waters of death, and

there takes ship with a Chaldæan Charon, who carries him within hail of his ancestor Hasisadra. That venerable personage not only gives Izdubar instructions how to regain his health, but tells him, somewhat *à propos des bottes* (after the manner of venerable personages), the long story of his perilous adventure; and how it befell that he, his wife, and his steersman came to dwell among the blessed gods, without passing through the portals of death like ordinary mortals.

According to the full story, the sins of mankind had become grievous; and, at a council of the gods, it was resolved to extirpate the whole race by a great flood. And, once more, let us note the uniformity of human experience. It would appear that, four thousand years ago, the obligations of confidential intercourse about matters of state were sometimes violated—of course from the best of motives. Ea, one of the three chiefs of the Chaldæan Pantheon, the god of justice and of practical wisdom, was also the god of the sea; and, yielding to the temptation to do a friend a good turn, irresistible to kindly seafaring folks of all ranks, he warned Hasisadra of what was coming. When Bel subsequently reproached him for this breach of confidence, Ea defended himself by declaring that he did not tell Hasisadra anything; he only sent him a dream. This was undoubtedly sailing very near the wind; but the attribution of a little benevolent obliquity of conduct to one of the

highest of the gods is a trifle compared with the truly Homeric anthropomorphism which characterises other parts of the epos.

The Chaldæan deities are, in truth, extremely human; and, occasionally, the narrator does not scruple to represent them in a manner which is not only inconsistent with our idea of reverence, but is sometimes distinctly humorous.[1] When the storm is at its height, he exhibits them flying in a state of panic to Anu, the god of heaven, and crouching before his portal like frightened dogs. As the smoke of Hasisadra's sacrifice arises, the gods, attracted by the sweet savour, are compared to swarms of flies. I have already remarked that the lady Istar's reputation is torn to shreds; while she and Ea scold Bel handsomely for his ferocity and injustice in destroying the innocent along with the guilty. One is reminded of Here hung up with weighted heels; of misleading dreams sent by Zeus; of Ares howling as he flies from the Trojan battlefield; and of the very questionable dealings of Aphrodite with Helen and Paris.

But to return to the story. Bel was, at first, excluded from the sacrifice as the author of all the mischief; which really was somewhat hard upon him, since the other gods agreed to his proposal. But eventually a reconciliation takes place; the great bow of Anu is displayed in the heavens; Bel

[1] Tiele (*Babylonisch-Assyrische Geschichte*, pp. 572-3) has some very just remarks on this aspect of the epos.

agrees that he will be satisfied with what war, pestilence, famine, and wild beasts can do in the way of destroying men; and that, henceforward, he will not have recourse to extraordinary measures. Finally, it is Bel himself who, by way of making amends, transports Hasisadra, his wife, and the faithful Nes-Hea to the abode of the gods.

It is as indubitable as it is incomprehensible to most of us, that, for thousands of years, a great people, quite as intelligent as we are, and living in as high a state of civilisation as that which had been attained in the greater part of Europe a few centuries ago, entertained not the slightest doubt that Anu, Bel, Ea, Istar, and the rest, were real personages, possessed of boundless powers for good and evil. The sincerity of the monarchs whose inscriptions gratefully attribute their victories to Merodach, or to Assur, is as little to be questioned as that of the authors of the hymns and penitential psalms which give full expression to the heights and depths of religious devotion. An "infidel" bold enough to deny the existence, or to doubt the influence, of these deities probably did not exist in all Mesopotamia; and even constructive rebellion against their authority was apt to end in the deprivation, not merely of the good name, but of the skin of the offender. The adherents of modern theological systems dismiss these objects of the love and fear of a hundred generations of their equals, offhand, as "gods of the

heathen," mere creations of a wicked and idolatrous imagination; and, along with them, they disown, as senseless, the crude theology, with its gross anthropomorphism and its low ethical conception of the divinity, which satisfied the pious souls of Chaldæa.

I imagine, though I do not presume to be sure, that any endeavour to save the intellectual and moral credit of Chaldæan religion, by suggesting the application to it of that universal solvent of absurdities, the allegorical method, would be scouted; I will not even suggest that any ingenuity can be equal to the discovery of the antitypes of the personifications effected by the religious imagination of later ages, in the triad Anu, Ea, and Bel, still less in Istar. Therefore, unless some plausible reconciliatory scheme should be propounded by a Neo-Chaldæan devotee (and, with Neo-Buddhists to the fore, this supposition is not so wild as it looks), I suppose the moderns will continue to smile, in a superior way, at the grievous absurdity of the polytheistic idolatry of these ancient people.

It is probably a congenital absence of some faculty which I ought to possess which withholds me from adopting this summary procedure. But I am not ashamed to share David Hume's want of ability to discover that polytheism is, in itself, altogether absurd. If we are bound, or permitted, to judge the government of the world by human

standards, it appears to me that directorates are proved, by familiar experience, to conduct the largest and the most complicated concerns quite as well as solitary despots. I have never been able to see why the hypothesis of a divine syndicate should be found guilty of innate absurdity. Those Assyrians, in particular, who held Assur to be the one supreme and creative deity, to whom all the other supernal powers were subordinate, might fairly ask that the essential difference between their system and that which obtains among the great majority of their modern theological critics should be demonstrated. In my apprehension, it is not the quantity, but the quality, of the persons, among whom the attributes of divinity are distributed, which is the serious matter. If the divine might is associated with no higher ethical attributes than those which obtain among ordinary men; if the divine intelligence is supposed to be so imperfect that it cannot foresee the consequences of its own contrivances; if the supernal powers can become furiously angry with the creatures of their omnipotence and, in their senseless wrath, destroy the innocent along with the guilty; or if they can show themselves to be as easily placated by presents and gross flattery as any oriental or occidental despot; if, in short, they are only stronger than mortal men and no better, as it must be admitted Hasisadra's deities proved themselves to be—then, surely, it is time for us to look some-

what closely into their credentials, and to accept none but conclusive evidence of their existence.

To the majority of my respected contemporaries this reasoning will doubtless appear feeble, if not worse. However, to my mind, such are the only arguments by which the Chaldæan theology can be satisfactorily upset. So far from there being any ground for the belief that Ea, Anu, and Bel are, or ever were, real entities, it seems to me quite infinitely more probable that they are products of the religious imagination, such as are to be found everywhere and in all ages, so long as that imagination riots uncontrolled by scientific criticism.

It is on these grounds that I venture, at the risk of being called an atheist by the ghosts of all the principals of all the colleges of Babylonia, or by their living successors among the Neo-Chaldæans, if that sect should arise, to express my utter disbelief in the gods of Hasisadra. Hence, it follows, that I find Hasisadra's account of their share in his adventure incredible; and, as the physical details of the flood are inseparable from its theophanic accompaniments, and are guaranteed by the same authority, I must let them go with the rest. The consistency of such details with probability counts for nothing. The inhabitants of Chaldæa must always have been familiar with inundations; probably no generation failed to witness an inundation which rose

unusually high, or was rendered serious by coincident atmospheric or other disturbances. And the memory of the general features of any exceptionally severe and devastating flood, would be preserved by popular tradition for long ages. What, then, could be more natural than that a Chaldæan poet should seek for the incidents of a great catastrophe among such phenomena? In what other way than by such an appeal to their experience could he so surely awaken in his audience the tragic pity and terror? What possible ground is there for insisting that he must have had some individual flood in view, and that his history is historical, in the sense that the account of the effects of a hurricane in the Bay of Bengal, in the year 1875, is historical?

More than three centuries after the time of Assurbanipal, Berosus of Babylon, born in the reign of Alexander the Great, wrote an account of the history of his country in Greek. The work of Berosus has vanished; but extracts from it—how far faithful is uncertain—have been preserved by later writers. Among these occurs the well-known story of the Deluge of Xisuthros, which is evidently built upon the same foundation as that of Hasisadra. The incidents of the divine warning, the building of the ship, the sending out of birds, the ascension of the hero, betray

their common origin. But stories, like Madeira, acquire a heightened flavour with time and travel; and the version of Berosus is characterised by those circumstantial improbabilities which habitually gather round the legend of a legend. The later narrator knows the exact day of the month on which the flood began. The dimensions of the ship are stated with Munchausenian precision at five stadia by two—say, half by one-fifth of an English mile. The ship runs aground among the "Gordæan mountains" to the south of Lake Van, in Armenia, beyond the limits of any imaginable real inundation of the Euphrates valley; and, by way of climax, we have the assertion, worthy of the sailor who said that he had brought up one of Pharaoh's chariot wheels on the fluke of his anchor in the Red Sea, that pilgrims visited the locality and made amulets of the bitumen which they scraped off from the still extant remains of the mighty ship of Xisuthros.

Suppose that some later polyhistor, as devoid of critical faculty as most of his tribe, had found the version of Bẹrosus, as well as another much nearer the original story; that, having too much respect for his authorities to make up a *tertium quid* of his own, out of the materials offered, he followed a practice, common enough among ancient and, particularly, among Semitic historians, of dividing both into fragments and piecing these

together, without troubling himself very much about the resulting repetitions and inconsistencies; the product of such a primitive editorial operation would be a narrative analogous to that which treats of the Noachian deluge in the book of Genesis. For the Pentateuchal story is indubitably a patchwork, composed of fragments of at least two, different and partly discrepant, narratives, quilted together in such an inartistic fashion that the seams remain conspicuous. And, in the matter of circumstantial exaggeration, it in some respects excels even the second-hand legend of Berosus.

There is a certain practicality about the notion of taking refuge from floods and storms in a ship provided with a steersman; but, surely, no one who had ever seen more water than he could wade through would dream of facing even a moderate breeze, in a huge three-storied coffer, or box, three hundred cubits long, fifty wide and thirty high, left to drift without rudder or pilot.[1] Not content with giving the exact year of Noah's

[1] In the second volume of the *History of the Euphrates Expedition*, p. 637, Col. Chesney gives a very interesting account of the simple and rapid manner in which the people about Tekrit and in the marshes of Lemlum construct large barges, and make them water-tight with bitumen. Doubtless the practice is extremely ancient; and as Colonel Chesney suggests, may possibly have furnished the conception of Noah's ark. But it is one thing to build a barge 44ft. long by 11ft. wide and 4ft. deep in the way described; and another to get a vessel of ten times the dimensions, so constructed, to hold together.

age in which the flood began, the Pentateuchal story adds the month and the day of the month. It is the Deity himself who "shuts in" Noah. The modest week assigned to the full deluge in Hasisadra's story becomes forty days, in one of the Pentateuchal accounts, and a hundred and fifty in the other. The flood, which, in the version of Berosus, has grown so high as to cast the ship among the mountains of Armenia, is improved upon in the Hebrew account until it covers "all the high hills that were under the whole heaven"; and, when it begins to subside, the ark is left stranded on the summit of the highest peak, commonly identified with Ararat itself.

While the details of Hasisadra's adventure are, at least, compatible with the physical conditions of the Euphrates valley, and, as we have seen, involve no catastrophe greater than such as might be brought under those conditions, many of the very precisely stated details of Noah's flood contradict some of the best established results of scientific inquiry.

If it is certain that the alluvium of the Mesopotamian plain has been brought down by the Tigris and the Euphrates, then it is no less certain that the physical structure of the whole valley has persisted, without material modification, for many thousand years before the date assigned to the flood. If the summits, even of

the moderately elevated ridges which immediately bound the valley, still more those of the Kurdish and Armenian mountains, were ever covered by water, for even forty days, that water must have extended over the whole earth. If the earth was thus covered, anywhere between 4000 and 5000 years ago, or, at any other time, since the higher terrestrial animals came into existence, they must have been destroyed from the whole face of it, as the Pentateuchal account declares they were three several times (Genesis vii. 21, 22, 23), in language which cannot be made more emphatic, or more solemn, than it is; and the present population must consist of the descendants of emigrants from the ark. And, if that is the case, then, as has often been pointed out, the sloths of the Brazilian forests, the kangaroos of Australia, the great tortoises of the Galapagos islands, must have respectively hobbled, hopped, and crawled over many thousand miles of land and sea from "Ararat" to their present habitations. Thus, the unquestionable facts of the geographical distribution of recent land animals, alone, form an insuperable obstacle to the acceptance of the assertion that the kinds of animals composing the present terrestrial fauna have been, at any time, universally destroyed in the way described in the Pentateuch.

It is upon this and other unimpeachable grounds, that, as I ventured to say some time ago,

persons who are duly conversant with even the elements of natural science decline to take the Noachian deluge seriously; and that, as I also pointed out, candid theologians, who, without special scientific knowledge, have appreciated the weight of scientific arguments, have long since given it up. But, as Goethe has remarked, there is nothing more terrible than energetic ignorance;[1] and there are, even yet, very energetic people, who are neither candid, nor clear-headed, nor theologians, still less properly instructed in the elements of natural science, who make prodigious efforts to obscure the effect of these plain truths, and to conceal their real surrender of the historical character of Noah's deluge under cover of the smoke of a great discharge of pseudoscientific artillery. They seem to imagine that the proofs which abound in all parts of the world, of large oscillations of the relative level of land and sea, combined with the probability that, when the sea-level was rising, sudden incursions of the sea like that which broke in over Holland and formed the Zuyder Zee, may have often occurred, can be made to look like evidence that something that, by courtesy, might be called a general Deluge has really taken place. Their discursive energy drags misunderstood truth into their service; and "the glacial epoch" is as sure to crop up among them

[1] "Es ist nichts schrecklicher als eine thätige Unwissenheit." *Maximen und Reflexionen*, iii.

as King Charles's head in a famous memorial—with about as much appropriateness The old story of the raised beach on Moel Tryfaen is trotted out; though, even if the facts are as yet rightly interpreted, there is not a shadow of evidence that the change of sea-level in that locality was sudden, or that glacial Welshmen would have known it was taking place.[1] Surely it is difficult to perceive the relevancy of bringing in something that happened in the glacial epoch (if it did happen) to account for the tradition of a flood in the Euphrates valley between 2000 and 3000 B.C. But the date of the Noachian flood is solidly fixed by the sole authority for it; no shuffling of the chronological data will carry it so far back as 3000 B.C.; and the Hebrew epos agrees with the Chaldæan in placing it after the development of a somewhat advanced civilisation. The only authority for the Noachian deluge assures us that, before it visited the earth, Cain had built cities; Jubal had invented harps and organs; while mankind had advanced so far beyond the neolithic, nay even the bronze, stage that Tubal-cain was a worker in iron. Therefore, if the Noachian legend is to be taken for the history of an event which happened in the glacial epoch, we must revise our notions of pleistocene

[1] The well-known difficulties connected with this case have recently been carefully discussed by Mr. Bell in the *Transactions* of the Geological Society of Glasgow.

civilisation. On the other hand, if the Pentateuchal story only means something quite different, that happened somewhere else, thousands of years earlier, dressed up, what becomes of its credit as history? I wonder what would be said to a modern historian who asserted that Pekin was burnt down in 1886, and then tried to justify the assertion by adducing evidence of the Great Fire of London in 1666. Yet the attempt to save the credit of the Noachian story by reference to something which is supposed to have happened in the far north, in the glacial epoch, is far more preposterous.

Moreover, these dust-raising dialecticians ignore some of the most important and well-known facts which bear upon the question. Anything more than a parochial acquaintance with physical geography and geology would suffice to remind its possessor that the Holy Land itself offers a standing protest against bringing such a deluge as that of Noah anywhere near it, either in historical times or in the course of that pleistocene period, of which the "great ice age" formed a part.

Judæa and Galilee, Moab and Gilead, occupy part of that extensive tableland at the summit of the western boundary of the Euphrates valley, to which I have already referred. If that valley had ever been filled with water to a height sufficient, not indeed to cover a third of Ararat, in the north, or half of some of the mountains of the

Persian frontier in the east, but to reach even four or five thousand feet, it must have stood over the Palestinian hog's back, and have filled, up to the brim, every depression on its surface. Therefore it could not have failed to fill that remarkable trench in which the Dead Sea, the Jordan, and the Sea of Galilee lie, and which is known as the "Jordan-Arabah" valley.

This long and deep hollow extends more than 200 miles, from near the site of ancient Dan in the north, to the water-parting at the head of the Wady Arabah in the south; and its deepest part, at the bottom of the basin of the Dead Sea, lies 2500 feet below the surface of the adjacent Mediterranean. The lowest portion of the rim of the Jordan-Arabah valley is situated at the village of El Fuleh, 257 feet above the Mediterranean. Everywhere else the circumjacent heights rise to a very much greater altitude. Hence, of the water which stood over the Syrian tableland, when as much drained off as could run away, enough would remain to form a "Mere" without an outlet, 2757 feet deep, over the present site of the Dead Sea. From this time forth, the level of the Palestinian mere could be lowered only by evaporation. It is an extremely interesting fact, which has happily escaped capture for the purposes of the energetic misunderstanding, that the valley, at one time, was filled, certainly within 150 feet of this height—probably higher. And it

is almost equally certain, that the time at which this great Jordan-Arabah mere reached its highest level coincides with the glacial epoch. But then the evidence which goes to prove this, also leads to the conclusion that this state of things obtained at a period considerably older than even 4000 B.C., when the world, according to the "Helps" (or shall we say "Hindrances") provided for the simple student of the Bible, was created; that it was not brought about by any diluvial catastrophe, but was the result of a change in the relative activities of certain natural operations which are quietly going on now; and that, since the level of the mere began to sink, many thousand years ago, no serious catastrophe of any description has affected the valley.

The evidence that the Jordan-Arabah valley really was once filled with water, the surface of which reached within 160 feet of the level of the pass of Jezrael, and possibly stood higher, is this: Remains of alluvial strata, containing shells of the freshwater mollusks which still inhabit the valley, worn down into terraces by waves which long rippled at the same level, and furrowed by the channels excavated by modern rainfalls, have been found at the former height; and they are repeated, at intervals, lower down, until the Ghor, or plain of the Jordan, itself an alluvial deposit, is reached. These strata attain a considerable thickness; and they indicate that the epoch at

which the freshwater mere of Palestine reached its highest level is extremely remote; that its diminution has taken place very slowly, and with periods of rest, during which the first formed deposits were cut down into terraces. This conclusion is strikingly borne out by other facts. A volcanic region stretches from Galilee to Gilead and the Hauran, on each side of the northern end of the valley. Some of the streams of basaltic lava which have been thrown out from its craters and clefts in times of which history has no record, have run athwart the course of the Jordan itself, or of that of some of its tributary streams. The lava streams, therefore, must be of later date than the depressions they fill. And yet, where they have thus temporarily dammed the Jordan and the Jermuk, these streams have had time to cut through the hard basalts and lay bare the beds, over which, before the lava streams invaded them, they flowed.

In fact, the antiquity of the present Jordan-Arabah valley, as a hollow in a tableland, out of reach of the sea, and troubled by no diluvial or other disturbances, beyond the volcanic eruptions of Gilead and of Galilee, is vast, even as estimated by a geological standard. No marine deposits of later than miocene age occur in or about it; and there is every reason to believe that the Syro-Arabian plateau has been dry land, throughout the pliocene and later epochs, down to the present

time. Raised beaches, containing recent shells, on the Levantine shores of the Mediterranean and on those of the Red Sea, testify to a geologically recent change of the sea level to the extent of 250 or 300 feet, probably produced by the slow elevation of the land; and, as I have already remarked, the alluvial plain of the Euphrates and Tigris appears to have been affected in the same way, though seemingly to a less extent. But of violent, or catastrophic, change there is no trace. Even the volcanic outbursts have flowed in even sheets over the old land surface; and the long lines of the horizontal terraces which remain, testify to the geological insignificance of such earthquakes as have taken place. It is, indeed, possible that the original formation of the valley may have been determined by the well-known fault, along which the western rocks are relatively depressed and the eastern elevated. But, whether that fault was effected slowly or quickly, and whenever it came into existence, the excavation of the valley to its present width, no less than the sculpturing of its steep walls and of the innumerable deep ravines which score them down to the very bottom, are indubitably due to the operation of rain and streams, during an enormous length of time, without interruption or disturbance of any magnitude. The alluvial deposits which have been mentioned are continued into the lateral ravines, and have more or less filled them. But, since the waters

have been lowered, these deposits have been cut down to great depths, and are still being excavated by the present temporary, or permanent, streams. Hence, it follows, that all these ravines must have existed before the time at which the valley was occupied by the great mere. This fact acquires a peculiar importance when we proceed to consider the grounds for the conclusion that the old Palestinian mere attained its highest level in the cold period of the pleistocene epoch. It is well known that glaciers formerly came low down on the flanks of Lebanon and Antilebanon; indeed, the old moraines are the haunts of the few survivors of the famous cedars. This implies a perennial snowcap of great extent on Hermon; therefore, a vastly greater supply of water to the sources of the Jordan which rise on its flanks; and, in addition, such a total change in the general climate, that the innumerable Wadys, now traversed only by occasional storm torrents, must have been occupied by perennial streams. All this involves a lower annual temperature and a moist and rainy atmosphere. If such a change of meteorological conditions could be effected now, when the loss by evaporation from the surface of the Dead Sea salt-pan balances all the gain from the Jordan and other streams, the scale would be turned in the other direction. The waters of the Dead Sea would become diluted; its level would rise; it would cover, first the plain of the Jordan, then the

lake of Galilee, then the middle Jordan between this lake and that of Huleh (the ancient Merom); and, finally, it would encroach, northwards, along the course of the upper Jordan, and, southwards, up the Wady Arabah, until it reached some 260 feet above the level of the Mediterranean, when it would attain a permanent level, by sending any superfluity through the pass of Jezrael to swell the waters of the Kishon, and flow thence into the Mediterranean.

Reverse the process, in consequence of the excess of loss by evaporation over gain by inflow, which must have set in as the climate of Syria changed after the end of the pleistocene epoch, and (without taking into consideration any other circumstances) the present state of things must eventually be reached—a concentrated saline solution in the deepest part of the valley—water, rather more charged with saline matter than ordinary fresh water, in the lower Jordan and the lake of Galilee —fresh waters, still largely derived from the snows of Hermon, in the upper Jordan and in Lake Huleh. But, if the full state of the Jordan valley marks the glacial epoch, then it follows that the excavation of that valley by atmospheric agencies must have occupied an immense antecedent time—a large part, perhaps the whole, of the pliocene epoch; and we are thus forced to the conclusion that, since the miocene epoch, the physical conformation of the Holy Land has been substantially what it is now.

It has been more or less rained upon, searched by earthquakes here and there, partially overflowed by lava streams, slowly raised (relatively to the sea-level) a few hundred feet. But there is not a shadow of ground for supposing that, throughout all this time, terrestrial animals have ceased to inhabit a large part of its surface; or that, in many parts, they have been, in any respect, incommoded by the changes which have taken place.

The evidence of the general stability of the physical conditions of Western Asia, which is furnished by Palestine and by the Euphrates Valley, is only fortified if we extend our view northwards to the Black Sea and the Caspian. The Caspian is a sort of magnified replica of the Dead Sea. The bottom of the deepest part of this vast inland mere is about 3000 feet below the level of the Mediterranean, while its surface is lower by 85 feet. At present, it is separated, on the west, by wide spaces of dry land from the Black Sea, which has the same height as the Mediterranean; and, on the east, from the Aral, 138 feet above that level. The waters of the Black Sea, now in communication with the Mediterranean by the Dardanelles and the Bosphorus, are salt, but become brackish northwards, where the rivers of the steppes pour in a great volume of fresh water. Those of the shallower northern half of the Caspian are similarly affected by the Volga and the Ural, while, in the shallow bays of the

southern division, they become extremely saline in consequence of the intense evaporation. The Aral Sea, though supplied by the Jaxartes and the Oxus, has brackish water. There is evidence that, in the pliocene and pleistocene periods, to go no farther back, the strait of the Dardanelles did not exist, and that the vast area, from the valley of the Danube to that of the Jaxartes, was covered by brackish or, in some parts, fresh water to a height of at least 200 feet above the level of the Mediterranean. At the present time, the water-parting which separates the northern part of the basin of the Caspian from the vast plains traversed by the Tobol and the Obi, in their course to the Arctic Ocean, appears to be less than 200 feet above the latter. It would seem, therefore, to be very probable that, under the climatal conditions of part of the pleistocene period, the valley of the Obi played the same part in relation to the Ponto-Aralian sea, as that of the Kishon may have done to the great mere of the Jordan valley; and that the outflow formed the channel by which the well-known Arctic elements of the fauna of the Caspian entered it. For the fossil remains imbedded in the strata continuously deposited in the Aralo-Caspian area, since the latter end of the miocene epoch, show no sign that, from that time onward, it has ever been covered by sea water. Therefore, the supposition of a free inflow of the Arctic Ocean, which at one

time was generally received, as well as that of various hypothetical deluges from that quarter, must be seriously questioned.

The Caspian and the Aral stand in somewhat the same relation to the vast basin of dry land in which they lie, as the Dead Sea and the lake of Galilee to the Jordan valley. They are the remains of a vast, mostly brackish, mere, which has dried up in consequence of the excess of evaporation over supply, since the cold and damp climate of the pleistocene epoch gave place to the increasing dryness and great summer heats of Central Asia in more modern times. The desiccation of the Aralo-Caspian basin, which communicated with the Black Sea only by a comparatively narrow and shallow strait along the present valley of Manytsch, the bottom of which was less than 100 feet above the Mediterranean, must have been vastly aided by the erosion of the strait of the Dardanelles towards the end of the pleistocene epoch, or perhaps later. For the result of thus opening a passage for the waters of the Black Sea into the Mediterranean must have been the gradual lowering of its level to that of the latter sea. When this process had gone so far as to bring down the Black Sea water to within less than a hundred feet of its present level, the strait of Manytsch ceased to exist; and the vast body of fresh water brought down by the Danube, the Dnieper, the Don, and other South

Russian rivers was cut off from the Caspian, and eventually delivered into the Mediterranean. Thus, there is as conclusive evidence as one can well hope to obtain in these matters, that, north of the Euphrates valley, the physical geography of an area as large as all Central Europe has remained essentially unchanged, from the miocene period down to our time; just as, to the west of the Euphrates valley, Palestine has exhibited a similar persistence of geographical type. To the south, the valley of the Nile tells exactly the same story. The holes bored by miocene mollusks in the cliffs east and west of Cairo bear witness that, in the miocene epoch, it contained an arm of the sea, the bottom of which has since been gradually filled up by the alluvium of the Nile, and elevated to its present position. But the higher parts of the Mokattam and of the desert about Ghizeh, have been dry land from that time to this. Too little is known of the geology of Persia, at present, to allow any positive conclusion to be enunciated. But, taking the name to indicate the whole continental mass of Iran, between the valleys of the Indus and the Euphrates, the supposition that its physical geography has remained unchanged for an immensely long period is hardly rash. The country is, in fact, an enormous basin, surrounded on all sides by a mountainous rim, and subdivided within by ridges into plateaus and hollows, the bottom of

the deepest of which, in the province of Seistan, probably descends to the level of the Indian Ocean. These depressions are occupied by salt marshes and deserts, in which the waters of the streams which flow down the sides of the basin are now dissipated by evaporation. I am acquainted with no evidence that the present Iranian basin was ever occupied by the sea; but the accumulations of gravel over a great extent of its surface indicate long-continued water action. It is, therefore, a fair presumption that large lakes have covered much of its present deserts, and that they have dried up by the operation of the same changed climatal conditions as those which have reduced the Caspian and the Dead Sea to their present dimensions.[1]

Thus it would seem that the Euphrates valley, the centre of the fabled Noachian deluge, is also the centre of a region covering some millions of square miles of the present continents of Europe, Asia, and Africa, in which all the facts, relevant to the argument, at present known, converge to the conclusion that, since the miocene epoch, the essential features of its physical geography have remained unchanged; that it has neither been depressed below the sea, nor swept by diluvial

[1] An instructive parallel is exhibited by the "Great Basin" of North America. See the remarkable memoir on *Lake Bonneville* by Mr. G. K. Gilbert, of the United States Geological Survey, just published.

waters since that time; and that the Chaldean version of the legend of a flood in the Euphrates valley is, of all those which are extant, the only one which is even consistent with probability, since it depicts a local inundation, not more severe than one which might be brought about by a concurrence of favourable conditions at the present day; and which might probably have been more easily effected when the Persian Gulf extended farther north. Hence, the recourse to the "glacial epoch" for some event which might colourably represent a flood, distinctly asserted by the only authority for it to have occurred in historical times, is peculiarly unfortunate. Even a Welsh antiquary might hesitate over the supposition that a tradition of the fate of Moel Tryfaen, in the glacial epoch, had furnished the basis of fact for a legend which arose among people whose own experience abundantly supplied them with the needful precedents. Moreover, if evidence of interchanges of land and sea are to be accepted as "confirmations" of Noah's deluge, there are plenty of sources for the tradition to be had much nearer than Wales.

The depression now filled by the Red Sea, for example, appears to be, geologically, of very recent origin. The later deposits found on its shores, two or three hundred feet above the sea level, contain no remains older than those of the present fauna; while, as I have already mentioned,

the valley of the adjacent delta of the Nile was a gulf of the sea in miocene times. But there is not a particle of evidence that the change of relative level which admitted the waters of the Indian Ocean between Arabia and Africa, took place any faster than that which is now going on in Greenland and Scandinavia, and which has left their inhabitants undisturbed. Even more remarkable changes were effected, towards the end of, or since, the glacial epoch, over the region now occupied by the Levantine Mediterranean and the Ægean Sea. The eastern coast region of Asia Minor, the western of Greece, and many of the intermediate islands, exhibit thick masses of stratified deposits of later tertiary age and of purely lacustrine characters; and it is remarkable that, on the south side of the island of Crete, such masses present steep cliffs facing the sea, so that the southern boundary of the lake in which they were formed must have been situated where the sea now flows. Indeed, there are valid reasons for the supposition that the dry land once extended far to the west of the present Levantine coast, and not improbably forced the Nile to seek an outlet to the north-east of its present delta—a possibility of no small importance in relation to certain puzzling facts in the geographical distribution of animals in this region. At any rate, continuous land joined Asia Minor with the Balkan peninsula; and its surface bore deep fresh-

water lakes, apparently disconnected with the Ponto-Aralian sea. This state of things lasted long enough to allow of the formation of the thick lacustrine strata to which I have referred. I am not aware that there is the smallest ground for the assumption that the Ægean land was broken up in consequence of any of the "catastrophes" which are so commonly invoked.[1] For anything that appears to the contrary, the narrow, steep-sided, straits between the islands of the Ægean archipelago may have been originally brought about by ordinary atmospheric and stream action; and may then have been filled from the Mediterranean, during a slow submergence proceeding from the south northwards. The strait of the Dardanelles is bounded by undisturbed pleistocene strata forty feet thick, through which, to all appearance, the present passage has been quietly cut.

That Olympus and Ossa were torn asunder and the waters of the Thessalian basin poured forth, is a very ancient notion, and an often cited "confirmation" of Deucalion's flood. It has not yet ceased to be in vogue, apparently because those who entertain it are not aware that modern geological investigation has conclusively proved that the gorge of the Peneus is as typical an

[1] It is true that earthquakes are common enough, but they are incompetent to produce such changes as those which have taken place.

example of a valley of erosion as any to be seen in Auvergne or in Colorado.[1]

Thus, in the immediate vicinity of the vast expanse of country which can be proved to have been untouched by any catastrophe before, during, and since the "glacial epoch," lie the great areas of the Ægean and the Red Sea, in which, during or since the glacial epoch, changes of the relative positions of land and sea have taken place, in comparison with which the submergence of Moel Tryfaen, with all Wales and Scotland to boot, does not come to much.

What, then, is the relevancy of talk about the "glacial epoch" to the question of the historical veracity of the narrator of the story of the Noachian deluge? So far as my knowledge goes, there is not a particle of evidence that destructive inundations were more common, over the general surface of the earth, in the glacial epoch than they have been before or since. No doubt the fringe of an ice-covered region must be always liable to them; but, if we examine the records of such catastrophes in historical times, those produced in the deltas of great rivers, or in lowlands like Holland, by sudden floods, combined with gales of wind or with unusual tides, far excel all others.

[1] See Teller, *Geologische Beschreibung des sud-östlichen Thessalien:* Denkschriften d. Akademie der Wissenschaften, Wien, Bd. xl. p. 199.

With respect to such inundations as are the consequences of earthquakes, and other slight movements of the crust of the earth, I have never heard of anything to show that they were more frequent and severer in the quaternary or tertiary epochs than they are now. In the discussion of these, as of all other geological problems, the appeal to needless catastrophes is born of that impatience of the slow and painful search after sufficient causes, in the ordinary course of nature, which is a temptation to all, though only energetic ignorance nowadays completely succumbs to it.

POSTSCRIPT.

My best thanks are due to Mr. Gladstone for his courteous withdrawal of one of the statements to which I have thought it needful to take exception. The familiarity with controversy, to which Mr. Gladstone alludes, will have accustomed him to the misadventures which arise when, as sometimes will happen in the heat of fence, the buttons come off the foils. I trust that any scratch which he may have received will heal as quickly as my own flesh wounds have done.

A contribution to the last number of this Review (*The Nineteenth Century*) of a different order would be left unnoticed, were it not that my silence would convert me into an accessory to misrepresentations of a very grave character. However, I shall restrict myself to the barest possible statement of facts, leaving my readers to draw their own conclusions.

In an article entitled "A Great Lesson," published in this Review for September, 1887 :

(1) The Duke of Argyll says the "overthrow of Darwin's speculations" (p. 301) concerning the origin of coral reefs, which

he fancied had taken place, had been received by men of science "with a grudging silence as far as public discussion is concerned" p. 301).

The truth is that, as every one acquainted with the literature of the subject was well aware, the views supposed to have effected this overthrow had been fully and publicly discussed by Dana in the United States; by Geikie, Green, and Prestwich in this country; by Lapparent in France; and by Credner in Germany.

(2) The Duke of Argyll says "that no serious reply has ever been attempted" (p. 305).

The truth is that the highest living authority on the subject, Professor Dana, published a most weighty reply, two years before the Duke of Argyll committed himself to this statement.

(3) The Duke of Argyll uses the preceding products of defective knowledge, multiplied by excessive imagination, to illustrate the manner in which "certain accepted opinions" established "a sort of Reign of Terror in their own behalf" (p. 307).

The truth is that no plea, except that of total ignorance of the literature of the subject, can excuse the errors cited, and that the "Reign of Terror" is a purely subjective phenomenon.

(4) The letter in "Nature" for the 17th of November, 1887, to which I am referred, contains neither substantiation, nor retractation, of statements 1 and 2. Nevertheless, it repeats number 3. The Duke of Argyll says of his article that it "has done what I intended it to do. It has called wide attention to the influence of mere authority in establishing erroneous theories and in retarding the progress of scientific truth."

(5) The Duke of Argyll illustrates the influence of his fictitious "Reign of Terror" by the statement that Mr. John Murray "was strongly advised against the publication of his views in derogation of Darwin's long-accepted theory of the coral islands, and was actually induced to delay it for two years" (p. 307). And in "Nature" for the 17th November, 1887, the Duke of Argyll states that he has seen a letter from Sir Wyville Thomson in which he "urged and almost insisted that Mr. Murray should withdraw the reading of his papers on the

subject from the Royal Society of Edinburgh. This was in February, 1877." The next paragraph, however, contains the confession: "No special reason was assigned." The Duke of Argyll proceeds to give a speculative opinion that "Sir Wyville dreaded some injury to the scientific reputation of the body of which he was the chief." Truly, a very probable supposition; but as Sir Wyville Thomson's tendencies were notoriously anti-Darwinian, it does not appear to me to lend the slightest justification to the Duke of Argyll's insinuation that the Darwinian "terror" influenced him. However, the question was finally set at rest by a letter which appeared in "Nature" (29th of December, 1887), in which the writer says that:

talking with Sir Wyville about "Murray's new theory," I asked what objection he had to its being brought before the public? The answer simply was: he considered that the grounds of the theory had not, as yet, been sufficiently investigated or sufficiently corroborated, and that therefore any immature, dogmatic publication of it would do less than little service either to science or to the author of the paper.

Sir Wyville Thomson was an intimate friend of mine, and I am glad to have been afforded one more opportunity of clearing his character from the aspersions which have been so recklessly cast upon his good sense and his scientific honour.

(6) As to the "overthrow" of Darwin's theory, which, according to the Duke of Argyll, was patent to every unprejudiced person four years ago, I have recently become acquainted with a work, in which a really competent authority,[1] thoroughly acquainted with all the new lights which have been thrown upon the subject during the last ten years, pronounces the judgment; firstly, that some of the facts brought forward by Messrs. Murray and Guppy against Darwin's theory are not facts; secondly, that the others are reconcilable with Darwin's theory; and, thirdly, that the theories of Messrs. Murray and

[1] Dr. Langenbeck, *Die Theorien über die Entstehung der Korallen-Inseln und Korallen-Riffe* (p. 13), 1890.

Guppy "are contradicted by a series of important facts" (p. 13).

Perhaps I had better draw attention to the circumstance that Dr. Langenbeck writes under shelter of the guns of the fortress of Strasburg; and may therefore be presumed to be unaffected by those dreams of a "Reign of Terror" which seem to disturb the peace of some of us in these islands (April, 1891).

[See, on the subject of this note, the essay entitled "An Episcopal Trilogy" in the following volume.]

VIII

THE EVOLUTION OF THEOLOGY: AN ANTHROPOLOGICAL STUDY

[1886]

I CONCEIVE that the origin, the growth, the decline, and the fall of those speculations respecting the existence, the powers, and the dispositions of beings analogous to men, but more or less devoid of corporeal qualities, which may be broadly included under the head of theology, are phenomena the study of which legitimately falls within the province of the anthropologist. And it is purely as a question of anthropology (a department of biology to which, at various times, I have given a good deal of attention) that I propose to treat of the evolution of theology in the following pages.

With theology as a code of dogmas which are to be believed, or at any rate repeated, under penalty of present or future punishment, or as a storehouse of anæsthetics for those who find the pains of life too hard to bear, I have nothing to

do; and, so far as it may be possible, I shall avoid the expression of any opinion as to the objective truth or falsehood of the systems of theological speculation of which I may find occasion to speak. From my present point of view, theology is regarded as a natural product of the operations of the human mind, under the conditions of its existence, just as any other branch of science, or the arts of architecture, or music, or painting are such products. Like them, theology has a history. Like them also, it is to be met with in certain simple and rudimentary forms; and these can be connected by a multitude of gradations, which exist or have existed, among people of various ages and races, with the most highly developed theologies of past and present times. It is not my object to interfere, even in the slightest degree, with beliefs which anybody holds sacred; or to alter the conviction of any one who is of opinion that, in dealing with theology, we ought to be guided by considerations different from those which would be thought appropriate if the problem lay in the province of chemistry or of mineralogy. And if people of these ways of thinking choose to read beyond the present paragraph, the responsibility for meeting with anything they may dislike rests with them and not with me.

We are all likely to be more familiar with the

theological history of the Israelites than with that of any other nation. We may therefore fitly make it the first object of our studies; and it will be convenient to commence with that period which lies between the invasion of Canaan and the early days of the monarchy, and answers to the eleventh and twelfth centuries B.C. or thereabouts. The evidence on which any conclusion as to the nature of Israelitic theology in those days must be based is wholly contained in the Hebrew Scriptures—an agglomeration of documents which certainly belong to very different ages, but of the exact dates and authorship of any one of which (except perhaps a few of the prophetical writings) there is no evidence, either internal or external, so far as I can discover, of such a nature as to justify more than a confession of ignorance, or, at most, an approximate conclusion. In this venerable record of ancient life, miscalled a book, when it is really a library comparable to a selection of works from English literature between the times of Beda and those of Milton, we have the stratified deposits (often confused and even with their natural order inverted) left by the stream of the intellectual and moral life of Israel during many centuries. And, embedded in these strata, there are numerous remains of forms of thought which once lived, and which, though often unfortunately mere fragments, are of priceless value to the

anthropologist. Our task is to rescue these from their relatively unimportant surroundings, and by careful comparison with existing forms of theology to make the dead world which they record live again. In other words, our problem is palæontological, and the method pursued must be the same as that employed in dealing with other fossil remains.

Among the richest of the fossiliferous strata to which I have alluded are the books of Judges and Samuel.[1] It has often been observed that these writings stand out, in marked relief from those which precede and follow them, in virtue of a certain archaic freshness and of a greater freedom from traces of late interpolation and editorial trimming. Jephthah, Gideon and Samson are men of old heroic stamp, who would look as much in place in a Norse Saga as where they are; and if the varnish-brush of later respectability has passed over these memoirs of the mighty men of a wild age, here and there, it has not succeeded in effacing, or even in seriously

[1] Even the most sturdy believers in the popular theory that the proper or titular names attached to the books of the Bible are those of their authors will hardly be prepared to maintain that Jephthah, Gideon, and their colleagues wrote the book of Judges. Nor is it easily admissible that Samuel wrote the two books which pass under his name, one of which deals entirely with events which took place after his death. In fact, no one knows who wrote either Judges or Samuel, nor when, within the range of 100 years, their present form was given to these books.

obscuring, the essential characteristics of the theology traditionally ascribed to their epoch.

There is nothing that I have met with in the results of Biblical criticism inconsistent with the conviction that these books give us a fairly trustworthy account of Israelitic life and thought in the times which they cover; and, as such, apart from the great literary merit of many of their episodes, they possess the interest of being, perhaps, the oldest genuine history, as apart from mere chronicles on the one hand and mere legends on the other, at present accessible to us.

But it is often said with exultation by writers of one party, and often admitted, more or less unwillingly, by their opponents, that these books are untrustworthy, by reason of being full of obviously unhistoric tales. And, as a notable example, the narrative of Saul's visit to the so-called "witch of Endor" is often cited. As I have already intimated, I have nothing to do with theological partisanship, either heterodox or orthodox, nor, for my present purpose, does it matter very much whether the story is historically true, or whether it merely shows what the writer believed; but, looking at the matter solely from the point of view of an anthropologist, I beg leave to express the opinion that the account of Saul's necromantic expedition is quite consistent with probability. That is to say, I see no reason

whatever to doubt, firstly, that Saul made such a visit; and, secondly, that he and all who were present, including the wise woman of Endor herself, would have given, with entire sincerity, very much the same account of the business as that which we now read in the twenty-eighth chapter of the first book of Samuel; and I am further of opinion that this story is one of the most important of those fossils, to which I have referred, in the material which it offers for the reconstruction of the theology of the time. Let us therefore study it attentively—not merely as a narrative which, in the dramatic force of its gruesome simplicity, is not surpassed, if it is equalled, by the witch scenes in Macbeth—but as a piece of evidence bearing on an important anthropological problem.

We are told (1 Sam. xxviii.) that Saul, encamped at Gilboa, became alarmed by the strength of the Philistine army gathered at Shunem. He therefore "inquired of Jahveh," but "Jahveh answered him not, neither by dreams, nor by Urim, nor by prophets."[1] Thus deserted by Jahveh, Saul, in his extremity, bethought him of "those that had familiar spirits, and the wizards," whom he is said, at some previous time, to have "put out of the land"; but who seem, nevertheless, to have been very imperfectly banished, since

[1] My citations are taken from the Revised Version, but for LORD and GOD I have substituted Jahveh and Elohim.

Saul's servants, in answer to his command to seek him a woman "that hath a familiar spirit," reply without a sign of hesitation or of fear, "Behold, there is a woman that hath a familiar spirit at Endor"; just as, in some parts of England, a countryman might tell any one who did not look like a magistrate or a policeman, where a "wise woman" was to be met with. Saul goes to this woman, who, after being assured of immunity, asks, "Whom shall I bring up to thee?" whereupon Saul says, "Bring me up Samuel." The woman immediately sees an apparition. But to Saul nothing is visible, for he asks, "What seest thou?" And the woman replies, "I see Elohim coming up out of the earth." Still the spectre remains invisible to Saul, for he asks, "What form is he of?" And she replies, "An old man cometh up, and he is covered with a robe." So far, therefore, the wise woman unquestionably plays the part of a "medium," and Saul is dependent upon her version of what happens.

The account continues :—

And Saul perceived that it was Samuel, and he bowed with his face to the ground and did obeisance. And Samuel said to Saul, Why hast thou disquieted me to bring me up? And Saul answered, I am sore distressed: for the Philistines make war against me, and Elohim is departed from me and answereth me no more, neither by prophets nor by dreams; therefore I have called thee that thou mayest make known unto me what I shall do. And Samuel said, Wherefore then dost thou ask of me, seeing that Jahveh is departed from thee and is become thine

adversary? And Jahveh hath wrought for himself, as he spake by me, and Jahveh hath rent the kingdom out of thine hand and given it to thy neighbour, even to David. Because thou obeyedst not the voice of Jahveh and didst not execute his fierce wrath upon Amalek, therefore hath Jahveh done this thing unto thee this day. Moreover, Jahveh will deliver Israel also with thee into the hands of the Philistines; and to-morrow shalt thou and thy sons be with me: Jahveh shall deliver the host of Israel also into the hand of the Philistines. Then Saul fell straightway his full length upon the earth and was sore afraid because of the words of Samuel . . . (v. 14-20).

The statement that Saul "perceived" that it was Samuel is not to be taken to imply that, even now, Saul actually saw the shade of the prophet, but only that the woman's allusion to the prophetic mantle and to the aged appearance of the spectre convinced him that it was Samuel. Reuss[1] in fact translates the passage "Alors Saul reconnut que c'était Samuel." Nor does the dialogue between Saul and Samuel necessarily, or probably, signify that Samuel spoke otherwise than by the voice of the wise woman. The Septuagint does not hesitate to call her ἐγγαστρίμυθος, that is to say, a ventriloquist, implying that it was she who spoke—and this view of the matter

[1] I need hardly say that I depend upon authoritative Biblical critics, whenever a question of interpretation of the text arises. As Reuss appears to me to be one of the most learned, acute, and fair-minded of those whose works I have studied, I have made most use of the commentary and dissertations in his splendid French edition of the Bible. But I have also had recourse to the works of Dillman, Kalisch, Kuenen, Thenius, Tuch, and others, in cases in which another opinion seemed desirable.

is in harmony with the fact that the exact sense of the Hebrew words which are translated as "a woman that hath a familiar spirit" is "a woman mistress of *Ob*." *Ob* means primitively a leather bottle, such as a wine skin, and is applied alike to the necromancer and to the spirit evoked. Its use, in these senses, appears to have been suggested by the likeness of the hollow sound emitted by a half-empty skin when struck, to the sepulchral tones in which the oracles of the evoked spirits were uttered by the medium. It is most probable that, in accordance with the general theory of spiritual influences which obtained among the old Israelites, the spirit of Samuel was conceived to pass into the body of the wise woman, and to use her vocal organs to speak in his own name—for I cannot discover that they drew any clear distinction between possession and inspiration.[1]

If the story of Saul's consultation of the occult powers is to be regarded as an authentic narrative, or, at any rate, as a statement which is perfectly veracious so far as the intention of the narrator goes—and, as I have said, I see no reason for refusing it this character—it will be found, on further consideration, to throw a flood of light, both directly and indirectly, on the theology of Saul's countrymen—that is to say, upon their

[1] See "Divination," by Hazoral, *Journal of Anthropology*, Bombay, vol. i. No. 1.

beliefs respecting the nature and ways of spiritual beings.

Even without the confirmation of other abundant evidences to the same effect, it leaves no doubt as to the existence, among them, of the fundamental doctrine that man consists of a body and of a spirit, which last, after the death of the body, continues to exist as a ghost. At the time of Saul's visit to Endor, Samuel was dead and buried; but that his spirit would be believed to continue to exist in Sheol may be concluded from the well-known passage in the song attributed to Hannah, his mother:—

> Jahveh killeth and maketh alive;
> He bringeth down to Sheol and bringeth up.
> (1 Sam. ii. 6.)

And it is obvious that this Sheol was thought to be a place underground in which Samuel's spirit had been disturbed by the necromancer's summons, and in which, after his return thither, he would be joined by the spirits of Saul and his sons when they had met with their bodily death on the hill of Gilboa. It is further to be observed that the spirit, or ghost, of the dead man presents itself as the image of the man himself—it is the man, not merely in his ordinary corporeal presentment (even down to the prophet's mantle) but in his moral and intellectual characteristics. Samuel, who had begun as Saul's friend and ended as his bitter enemy, gives

it to be understood that he is annoyed at Saul's presumption in disturbing him; and that, in Sheol, he is as much the devoted servant of Jahveh and as much empowered to speak in Jahveh's name as he was during his sojourn in the upper air.

It appears now to be universally admitted that, before the exile, the Israelites had no belief in rewards and punishments after death, nor in anything similar to the Christian heaven and hell; but our story proves that it would be an error to suppose that they did not believe in the continuance of individual existence after death by a ghostly simulacrum of life. Nay, I think it would be very hard to produce conclusive evidence that they disbelieved in immortality; for I am not aware that there is anything to show that they thought the existence of the souls of the dead in Sheol ever came to an end. But they do not seem to have conceived that the condition of the souls in Sheol was in any way affected by their conduct in life. If there was immortality, there was no state of retribution in their theology. Samuel expects Saul and his sons to come to him in Sheol.

The next circumstance to be remarked is that the name of *Elohim* is applied to the spirit which the woman sees "coming up out of the earth," that is to say, from Sheol. The Authorised Version translates this in its literal sense "gods." The Revised Version gives "god" with "gods" in the

margin. Reuss renders the word by "spectre," remarking in a note that it is not quite exact; but that the word Elohim expresses "something divine, that is to say, superhuman, commanding respect and terror" ("Histoire des Israélites," p. 321). Tuch, in his commentary on Genesis, and Thenius, in his commentary on Samuel, express substantially the same opinion. Dr. Alexander (in Kitto's "Cyclopædia" s. v. "God") has the following instructive remarks:—

> [*Elohim* is] sometimes used vaguely to describe unseen powers or superhuman beings that are not properly thought of as divine. Thus the witch of Endor saw "Elohim ascending out of the earth" (1 Sam. xxviii. 13), meaning thereby some beings of an unearthly, superhuman character. So also in Zechariah xii. 8, it is said "the house of David shall be as Elohim, as the angel of the Lord," where, as the transition from Elohim to the angel of the Lord is a minori ad majus, we must regard the former as a vague designation of supernatural powers.

Dr. Alexander speaks here of "beings"; but there is no reason to suppose that the wise woman of Endor referred to anything but a solitary spectre; and it is quite clear that Saul understood her in this sense, for he asks "What form is HE of?"

This fact, that the name of Elohim is applied to a ghost, or disembodied soul, conceived as the image of the body in which it once dwelt, is of no little importance. For it is is well known that the same term was employed to denote the gods

of the heathen, who were thought to have definite quasi-corporeal forms and to be as much real entities as any other Elohim.[1] The difference which was supposed to exist between the different Elohim was one of degree, not one of kind. Elohim was, in logical terminology, the genus of which ghosts, Chemosh, Dagon, Baal, and Jahveh were species. The Israelite believed Jahveh to be immeasurably superior to all other kinds of Elohim. The inscription on the Moabite stone shows that King Mesa held Chemosh to be, as unquestionably, the superior of Jahveh. But if Jahveh was thus supposed to differ only in degree from the undoubtedly zoomorphic or anthropomorphic "gods of the nations," why is it to be assumed that he also was not thought of as having a human shape? It is possible for those who forget that the time of the great prophetic writers is at least as remote from that of Saul as our day is from that of Queen Elizabeth, to insist upon interpreting the gross notions current in the earlier age and among the mass of the people by the refined conceptions promulgated by a few select spirits centuries later. But if we take the language constantly used concerning the Deity in

[1] See, for example, the message of Jephthah to the King of the Ammonites: "So now Jahveh, the Elohim of Israel, hath dispossessed the Amorites from before his people Israel, and shouldest thou possess them? Wilt not thou possess that which Chemosh, thy Elohim, giveth thee to possess?" (Jud. xi. 23, 24). For Jephthah, Chemosh is obviously as real a personage as Jahveh.

the books of Genesis, Exodus, Joshua, Judges, Samûël, or Kings, in its natural sense (and I am aware of no valid reason which can be given for taking it in any other sense), there cannot, to my mind, be a doubt that Jahveh was conceived by those from whom the substance of these books is mainly derived, to possess the appearance and the intellectual and moral attributes of a man; and, indeed, of a man of just that type with which the Israelites were familiar in their stronger and intellectually abler rulers and leaders. In a well-known passage in Genesis (i. 27) Elohim is said to have "created man in his own image, in the image of Elohim created he him." It is "man" who is here said to be the image of Elohim—not man's soul alone, still less his "reason," but the whole man. It is obvious that for those who call a manlike ghost Elohim, there could be no difficulty in conceiving any other Elohim under the same aspect. And if there could be any doubt on this subject, surely it cannot stand in the face of what we find in the fifth chapter, where, immediately after a repetition of the statement that "Elohim created man, in the likeness of Elohim made he him," it is said that Adam begat Seth "in his own likeness, after his image." Does this mean that Seth resembled Adam only in a spiritual and figurative sense? And if that interpretation of the third verse of the fifth chapter of Genesis is absurd, why does it be-

come reasonable in the first verse of the same chapter?

But let us go further. Is not the Jahveh who "walks in the garden in the cool of the day"; from whom one may hope to "hide oneself among the trees"; of whom it is expressly said that "Moses and Aaron, Nadab and Abihu, and seventy of the elders of Israel," saw the Elohim of Israel (Exod. xxiv. 9-11); and that, although the seeing Jahveh was understood to be a high crime and misdemeanour, worthy of death, under ordinary circumstances, yet, for this once, he "laid not his hand on the nobles of Israel"; "that they beheld Elohim and did eat and drink"; and that afterwards Moses saw his back (Exod. xxxiii. 23) —is not this Deity conceived as manlike in form? Again, is not the Jahveh who eats with Abraham under the oaks at Mamre, who is pleased with the "sweet savour" of Noah's sacrifice, to whom sacrifices are said to be "food"[1]—is not this Deity depicted as possessed of human appetites? If this were not the current Israelitish idea of Jahveh even in the eighth century B.C., where is the point of Isaiah's scathing admonitions to his countrymen: "To what purpose is the multitude of your sacrifices unto me? saith Jahveh: I am full of the burnt-offerings of rams and the fat

[1] For example: "My oblation, my food for my offerings made by fire, of a sweet savour to me, shall ye observe to offer unto me in their due season" (Num. xxviii. 2).

of fed beasts; and I delight not in the blood of bullocks, or of lambs, or of he-goats" (Isa. i. 11). Or of Micah's inquiry, "Will Jahveh be pleased with thousands of rams or with ten thousands of rivers of oil?" (vi. 7.) And in the innumerable passages in which Jahveh is said to be jealous of other gods, to be angry, to be appeased, and to repent; in which he is represented as casting off Saul because the king does not quite literally execute a command of the most ruthless severity; or as smiting Uzzah to death because the unfortunate man thoughtlessly, but naturally enough, put out his hand to stay the ark from falling—can any one deny that the old Israelites conceived Jahveh not only in the image of a man, but in that of a changeable, irritable, and, occasionally, violent man? There appears to me, then, to be no reason to doubt that the notion of likeness to man, which was indubitably held of the ghost Elohim, was carried out consistently throughout the whole series of Elohim, and that Jahveh-Elohim was thought of as a being of the same substantially human nature as the rest, only immeasurably more powerful for good and for evil.

The absence of any real distinction between the Elohim of different ranks is further clearly illustrated by the corresponding absence of any sharp delimitation between the various kinds of people who serve as the media of communication between them and men. The agents through

whom the lower Elohim are consulted are called necromancers, wizards, and diviners, and are looked down upon by the prophets and priests of the higher Elohim; but the "seer" connects the two, and they are all alike in their essential characters of media. The wise woman of Endor was believed by others, and, I have little doubt, believed herself, to be able to "bring up" whom she would from Sheol, and to be inspired, whether in virtue of actual possession by the evoked Elohim, or otherwise, with a knowledge of hidden things. I am unable to see that Saul's servant took any really different view of Samuel's powers, though he may have believed that he obtained them by the grace of the higher Elohim. For when Saul fails to find his father's asses, his servant says to him—

> Behold, there is in this city a man of Elohim, and he is a man that is held in honour; all that he saith cometh surely to pass: now let us go thither; peradventure he can tell us concerning our journey whereon we go. Then said Saul to his servant, But behold if we go, what shall we bring the man? for the bread is spent in our vessels and there is not a present to bring to the man of Elohim. What have we? And the servant answered Saul again and said, Behold I have in my hand the fourth part of a shekel of silver: that will I give to the man of Elohim to tell us our way. (Beforetime in Israel when a man went to inquire of Elohim, then he said, Come and let us go to the Seer: for he that is now called a Prophet was beforetime called a Seer[1]) (1 Sam. ix. 6-10).

[1] In 2 Samuel xv. 27 David says to Zadok the priest, "Art thou not a seer?" and Gad is called David's seer.

In fact, when, shortly afterwards, Saul accidentally meets Samuel, he says, "Tell me, I pray thee, where the Seer's house is." Samuel answers, "I am the Seer." Immediately afterwards Samuel informs Saul that the asses are found, though how he obtained his knowledge of the fact is not stated. It will be observed that Samuel is not spoken of here as, in any special sense, a seer or prophet of Jahveh, but as a "man of Elohim"—that is to say, a seer having access to the "spiritual powers," just as the wise woman of Endor might have been said to be a "woman of Elohim"—and the narrator's or editor's explanatory note seems to indicate that "Prophet" is merely a name, introduced later than the time of Samuel, for a superior kind of "Seer," or "man of Elohim." [1]

Another very instructive passage shows that Samuel was not only considered to be diviner, seer, and prophet in one, but that he was also, to all intents and purposes, priest of Jahveh—though, according to his biographer, he was not a member of the tribe of Levi. At the outset of their acquaintance, Samuel says to Saul, "Go up before me into the high place," where, as the young maidens of the city had just before told Saul, the

[1] This would at first appear to be inconsistent with the use of the word "prophetess" for Deborah. But it does not follow because the writer of Judges applies the name to Deborah that it was used in her day.

Seer was going, "for the people will not eat till he come, because he doth bless the sacrifice" (1 Sam. x. 12). The use of the word "bless" here—as if Samuel were not going to sacrifice, but only to offer a blessing or thanksgiving—is curious. But that Samuel really acted as priest seems plain from what follows. For he not only asks Saul to share in the customary sacrificial feast, but he disposes in Saul's favour of that portion of the victim which the Levitical legislation, doubtless embodying old customs, recognises as the priest's special property.[1]

Although particular persons adopted the profession of media between men and Elohim, there was no limitation of the power, in the view of ancient Israel, to any special class of the population. Saul inquires of Jahveh and builds him altars on his own account; and in the very remarkable story told in the fourteenth chapter of the first book of Samuel (v. 37-46), Saul appears to conduct the whole process of divination,

[1] Samuel tells the cook, "Bring the portion which I gave thee, of which I said to thee, Set it by thee." It was therefore Samuel's to give. "And the cook took up the thigh (or shoulder) and that which was upon it and set it before Saul." But, in the Levitical regulations, it is the thigh (or shoulder) which becomes the priest's own property. "And the right thigh (or shoulder) shall ye give unto the priest for an heave-offering," which is given along with the wave breast "unto Aaron the priest and unto his sons as a due for ever from the children of Israel" (Lev. vii. 31-34). Reuss writes on this passage: "La cuisse n'est point agitée, mais simplement *prélevée* sur ce que les convives mangeront."

although he has a priest at his elbow. David seems to do the same.

Moreover, Elohim constantly appear in dreams —which in old Israel did not mean that, as we should say, the subject of the appearance "dreamed he saw the spirit"; but that he veritably saw the Elohim which, as a soul, visited his soul while his body was asleep. And, in the course of the history of Israel, Jahveh himself thus appears to all sorts of persons, non-Israelites as well as Israelites. Again, the Elohim possess, or inspire, people against their will, as in the case of Saul and Saul's messengers, and then these people prophesy—that is to say, "rave"—and exhibit the ungoverned gestures attributed by a later age to possession by malignant spirits. Apart from other evidence to be adduced by and by, the history of ancient demonology and of modern revivalism does not permit me to doubt that the accounts of these phenomena given in the history of Saul may be perfectly historical.

In the ritual practices, of which evidence is to be found in the books of Judges and Samuel, the chief part is played by sacrifices, usually burnt offerings. Whenever the aid of the Elohim of Israel is sought, or thanks are considered due to him, an altar is built, and oxen, sheep, and goats are slaughtered and offered up. Sometimes the entire victim is burnt as a holocaust; more frequently only certain parts, notably the fat

about the kidneys, are burnt on the altar. The rest is properly cooked; and, after the reservation of a part for the priest, is made the foundation of a joyous banquet, in which the sacrificer, his family, and such guests as he thinks fit to invite, participate.[1] Elohim was supposed to share in the feast, and it has been already shown that that which was set apart on the altar, or consumed by fire, was spoken of as the food of Elohim, who was thought to be influenced by the costliness, or by the pleasant smell, of the sacrifice in favour of the sacrificer.

All this bears out the view that, in the mind of the old Israelite, there was no difference, save one of degree, between one Elohim and another. It is true that there is but little direct evidence to show that the old Israelites shared the widespread belief of their own, and indeed of all times, that the spirits of the dead not only continue to exist, but are capable of a ghostly kind of feeding and are grateful for such aliment as can be assimilated by their attenuated substance, and even for clothes, ornaments, and weapons.[2] That they

[1] See, for example, Elkanah's sacrifice, 1 Sam. i. 3-9.

[2] The ghost was not supposed to be capable of devouring the gross material substance of the offering; but his vaporous body appropriated the smoke of the burnt sacrifice, the visible and odorous exhalations of other offerings. The blood of the victim was particularly useful because it was thought to be the special seat of its soul or life. A West African negro replied to an European sceptic: "Of course, the spirit cannot eat corporeal food, but he extracts its spiritual part, and, as we see, leaves the material part behind" (Lippert, *Seelencult*, p. 16).

were familiar with this doctrine in the time of the captivity is suggested by the well-known reference of Ezekiel (xxxii. 27) to the "mighty that are fallen of the uncircumcised, which are gone down to [Sheol] hell with their weapons of war, and have laid their swords under their heads." Perhaps there is a still earlier allusion in the "giving of food for the dead" spoken of in Deuteronomy (xxvi. 14).[1]

It must be remembered that the literature of the old Israelites, as it lies before us, has been subjected to the revisal of strictly monotheistic editors, violently opposed to all kinds of idolatry, who are not likely to have selected from the materials at their disposal any obvious evidence, either of the practice under discussion, or of that ancestor-worship which is so closely related to it,

[1] It is further well worth consideration whether indications of former ancestor-worship are not to be found in the singular weight attached to the veneration of parents in the fourth commandment. It is the only positive commandment, in addition to those respecting the Deity and that concerning the Sabbath, and the penalties for infringing it were of the same character. In China, a corresponding reverence for parents is part and parcel of ancestor-worship; so in ancient Rome and in Greece (where parents were even called δεύτεροι καὶ ἐπίγεοι θεοί). The fifth commandment, as it stands, would be an excellent compromise between ancestor-worship and monotheism. The larger hereditary share allotted by Israelitic law to the eldest son reminds one of the privileges attached to primogeniture in ancient Rome, which were closely connected with ancestor-worship. There is a good deal to be said in favour of the speculation that the ark of the covenant may have been a relic of ancestor-worship; but that topic is too large to be dealt with incidentally in this place.

for preservation in the permanent records of their people.

The mysterious objects known as *Teraphim*, which are occasionally mentioned in Judges, Samuel, and elsewhere, however, can hardly be interpreted otherwise than as indications of the existence both of ancestor-worship and of image-worship in old Israel. The teraphim were certainly images of family gods, and, as such, in all probability represented deceased ancestors. Laban indignantly demands of his son-in-law, "Wherefore hast thou stolen my Elohim?" which Rachel, who must be assumed to have worshipped Jacob's God, Jahveh, had carried off, obviously because she, like her father, believed in their divinity. It is not suggested that Jacob was in any way scandalised by the idolatrous practices of his favourite wife, whatever he may have thought of her honesty when the truth came to light; for the teraphim seem to have remained in his camp, at least until he "hid" his strange gods "under the oak that was by Shechem" (Gen. xxxv. 4). And indeed it is open to question if he got rid of them then, for the subsequent history of Israel renders it more than doubtful whether the teraphim were regarded as "strange gods" even as late as the eighth century B.C.

The writer of the books of Samuel takes it quite as a matter of course that Michal, daughter of one royal Jahveh worshipper and wife of the

servant of Jahveh *par excellence*, the pious David, should have her teraphim handy, in her and David's chamber, when she dresses them up in their bed into a simulation of her husband, for the purpose of deceiving her father's messengers. Even one of the early prophets, Hosea, when he threatens that the children of Israel shall abide many days without "ephod or teraphim" (iii. 4), appears to regard both as equally proper appurtenances of the suspended worship of Jahveh, and equally certain to be restored when that is resumed. When we further take into consideration that only in the reign of Hezekiah was the brazen serpent, preserved in the temple and believed to be the work of Moses, destroyed, and the practice of offering incense to it, that is, worshipping it, abolished—that Jeroboam could set up "calves of gold" for Israel to worship, with apparently none but a political object, and certainly with no notion of creating a schism among the worshippers of Jahveh, or of repelling the men of Judah from his standard—it seems obvious, either that the Israelites of the tenth and eleventh centuries B.C. knew not the second commandment, or that they construed it merely as part of the prohibition to worship any supreme god other than Jahveh, which precedes it.

In seeking for information about the teraphim, I lighted upon the following passage in the valuable article on that subject by Archdeacon

Farrar, in Kitto's "Cyclopædia of Biblical Literature," which is so much to the purpose of my argument, that I venture to quote it in full:—

The main and certain results of this review are that the teraphim were rude human images; that the use of them was an antique Aramaic custom; that there is reason to suppose them to have been images of deceased ancestors; that they were consulted oracularly; that they were not confined to Jews; that their use continued down to the latest period of Jewish history; and lastly, that although the enlightened prophets and strictest later kings regarded them as idolatrous, the priests were much less averse to such images, and their cult was not considered in any way repugnant to the pious worship of Elohim, nay, even to the worship of him "under the awful title of Jehovah." In fact, they involved *a monotheistic idolatry very different indeed from polytheism;* and the tolerance of them by priests, as compared with the denunciation of them by the prophets, offers a close analogy to the views of the Roman Catholics respecting pictures and images as compared with the views of Protestants. It was against this use of idolatrous symbols and emblems in a monotheistic worship that the *second* commandment was directed, whereas the first is aimed against the graver sin of direct polytheism. But the whole history of Israel shows how utterly and how early the law must have fallen into desuetude. The worship of the golden calf and of the calves at Dan and Bethel, against which, so far as we know, neither Elijah nor Elisha said a single word; the tolerance of high places, teraphim and betylia; the offering of incense for centuries to the brazen serpent destroyed by Hezekiah; the occasional glimpses of the most startling irregularities sanctioned apparently even in the temple worship itself, prove most decisively that a pure monotheism and an independence of symbols was the result of a slow and painful course of God's disciplinal dealings among the noblest thinkers of a single nation, and not, as is so constantly and erroneously

urged, the instinct of the whole Semitic race; in other words, one single branch of the Semites was under God's providence *educated* into pure monotheism only by centuries of misfortune and series of inspired men (vol. iii. p. 986).

It appears to me that the researches of the anthropologist lead him to conclusions identical in substance, if not in terms, with those here enunciated as the result of a careful study of the same subject from a totally different point of view.

There is abundant evidence in the books of Samuel and elsewhere that an article of dress termed an *ephod* was supposed to have a peculiar efficacy in enabling the wearer to exercise divination by means of Jahveh-Elohim. Great and long continued have been the disputes as to the exact nature of the ephod—whether it always means something to wear, or whether it sometimes means an image. But the probabilities are that it usually signifies a kind of waistcoat or broad zone, with shoulder-straps, which the person who "inquired of Jahveh" put on. In 1 Samuel xxiii. 2 David appears to have inquired without an ephod, for Abiathar the priest is said to have "come down with an ephod in his hand" only subsequently. And then David asks for it before inquiring of Jahveh whether the men of Keilah would betray him or not. David's action is obviously divination pure and simple; and it is curious that he seems to have worn the ephod

himself and not to have employed Abiathar as a medium. How the answer was given is not clear, though the probability is that it was obtained by casting lots. The *Urim* and *Thummim* seem to have been two such lots of a peculiarly sacred character, which were carried in the pocket of the high priest's "breastplate." This last was worn along with the ephod.

With the exception of one passage (1 Sam. xiv. 18) the ark is ignored in the history of Saul. But in this place the Septuagint reads "ephod" for ark, while in 1 Chronicles xiii. 3 David says that "we sought not unto it [the ark] in the days of Saul." Nor does Samuel seem to have paid any regard to the ark after its return from Philistia; though, in his childhood, he is said to have slept in "the temple of Jahveh, where the ark of Elohim was" (1 Sam. iii. 3), at Shiloh, and there to have been the seer of the earliest apparitions vouchsafed to him by Jahveh. The space between the cherubim or winged images on the canopy or cover (*Kapporeth*) of this holy chest was held to be the special seat of Jahveh—the place selected for a temporary residence of the Supreme Elohim who had, after Aaron and Phineas, Eli and his sons for priests and seers. And, when the ark was carried to the camp at Eben-ezer, there can be no doubt that the Israelites, no less than the Philistines, held that "Elohim is come into the camp" (iv. 7), and that

the one, as much as the other, conceived that the Israelites had summoned to their aid a powerful ally in "these (or this) mighty Elohim" —elsewhere called Jahve-Sabaoth, the Jahveh of Hosts. If the "temple" at Shiloh was the pentateuchal tabernacle, as is suggested by the name of "tent of meeting" given to it in 1 Samuel ii. 22, it was essentially a large tent, though constituted of very expensive and ornate materials; if, on the other hand, it was a different edifice, there can be little doubt that this "house of Jahveh" was built on the model of an ordinary house of the time. But there is not the slightest evidence that, during the reign of Saul, any greater importance attached to this seat of the cult of Jahveh than to others. Sanctuaries, and "high places" for sacrifice, were scattered all over the country from Dan to Beersheba. And, as Samuel is said to have gone up to one of these high places to bless the sacrifice, it may be taken for tolerably certain that he knew nothing of the Levitical laws which severely condemn the high places and those who sacrifice away from the sanctuary hallowed by the presence of the ark.

There is no evidence that, during the time of the Judges and of Samuel, any one occupied the position of the high priest of later days. And persons who were neither priests nor Levites sacrificed and divined or "inquired of Jahveh,"

when they pleased and where they pleased, without the least indication that they, or any one else in Israel at that time, knew they were doing wrong. There is no allusion to any special observance of the Sabbath; and the references to circumcision are indirect.

Such are the chief articles of the theological creed of the old Israelites, which are made known to us by the direct evidence of the ancient record to which we have had recourse, and they are as remarkable for that which they contain as for that which is absent from them. They reveal a firm conviction that, when death takes place, a something termed a soul or spirit leaves the body and continues to exist in Sheol for a period of indefinite duration, even though there is no proof of any belief in absolute immortality; that such spirits can return to earth to possess and inspire the living; that they are, in appearance and in disposition, likenesses of the men to whom they belonged, but that, as spirits, they have larger powers and are freer from physical limitations; that they thus form a group among a number of kinds of spiritual existences known as Elohim, of whom Jahveh, the national God of Israel, is one; that, consistently with this view, Jahveh was conceived as a sort of spirit, human in aspect and in senses, and with many human passions, but with immensely greater intelligence and power than

any other Elohim, whether human or divine. Further, the evidence proves that this belief was the basis of the Jahveh-worship to which Samuel and his followers were devoted; that there is strong reason for believing, and none for doubting, that idolatry, in the shape of the worship of the family gods or teraphim, was practised by sincere and devout Jahveh-worshippers; that the ark, with its protective tent or tabernacle, was regarded as a specially, but by no means exclusively, favoured sanctuary of Jahveh; that the ephod appears to have had a particular value for those who desired to divine by the help of Jahveh; and that divination by lots was practised before Jahveh. On the other hand, there is not the slightest evidence of any belief in retribution after death, but the contrary; ritual obligations have at least as strong sanction as moral; there are clear indications that some of the most stringent of the Levitical laws were unknown even to Samuel; priests often appear to be superseded by laymen, even in the performance of sacrifices and divination; and no line of demarcation can be drawn between necromancer, wizard, seer, prophet, and priest, each of whom is regarded, like all the rest, as a medium of communication between the world of Elohim and that of living men.

The theological system thus defined offers to the anthropologist no feature which is devoid of a

parallel in the known theologies of other races of mankind, even of those who inhabit parts of the world most remote from Palestine. And the foundation of the whole, the ghost theory, is exactly that theological speculation which is the most widely spread of all, and the most deeply rooted among uncivilised men. I am able to base this statement, to some extent, on facts within my own knowledge. In December 1848, H.M.S. *Rattlesnake*, the ship to which I then belonged, was anchored off Mount Ernest, an island in Torres Straits. The people were few and well disposed; and, when a friend of mine (whom I will call B.) and I went ashore, we made acquaintance with an old native, Paouda by name. In course of time we became quite intimate with the old gentleman, partly by the rendering of mutual good offices, but chiefly because Paouda believed he had discovered that B. was his father-in-law. And his grounds for this singular conviction were very remarkable. We had made a long stay at Cape York hard by; and, in accordance with a theory which is widely spread among the Australians, that white men are the reincarnated spirits of black men, B. was held to be the ghost, or *narki*, of a certain Mount Ernest native, one Antarki, who had lately died, on the ground of some real or fancied resemblance to the latter. Now Paouda had taken to wife a daughter of Antarki's, named Domani, and as soon as B.

informed him that he was the ghost of Antarki, Paouda at once admitted the relationship and acted upon it. For, as all the women on the island had hidden away in fear of the ship, and we were anxious to see what they were like, B. pleaded pathetically with Paouda that it would be very unkind not to let him see his daughter and grandchildren. After a good deal of hesitation and the exaction of pledges of deep secrecy, Paouda consented to take B., and myself as B.'s friend, to see Domani and the three daughters, by whom B. was received quite as one of the family, while I was courteously welcomed on his account.

This scene made an impression upon me which is not yet effaced. It left no question on my mind of the sincerity of the strange ghost theory of these savages, and of the influence which their belief has on their practical life. I had it in my mind, as well as many a like result of subsequent anthropological studies, when, in 1869,[1] I wrote as follows:—

> There are savages without God in any proper sense of the word, but none without ghosts. And the Fetishism, Ancestor-worship, Hero-worship, and Demonology of primitive savages are all, I believe, different manners of expression of their belief in ghosts, and of the anthropomorphic interpretation of out-of-the-way events which is its concomitant. Witchcraft and sorcery are the practical expressions of these beliefs; and they stand in the same relation to religious worship as the simple anthropomorphism of children or savages does to theology.

[1] "The Scientific Aspects of Positivism," *Fortnightly Review*, 1869, republished in *Lay Sermons*.

I do not quote myself with any intention of making a claim to originality in putting forth this view; for I have since discovered that the same conception is virtually contained in the great "Discours sur l'Histoire Universelle" of Bossuet, now more than two centuries old :—

> Le culte des hommes morts faisoit presque tout le fond de l'idolâtrie : presque tous les hommes sacrifioient aux mânes, c'est-à-dire aux âmes des morts. De si anciennes erreurs nous font voir à la vérité combien étoit ancienne la croyance de l'immortalité de l'âme, et nous montrent qu'elle doit être rangée parmi les premières traditions du genre humain. Mais l'homme, qui gâtoit tout, en avoit étrangement abusé, puisqu'elle le portoit à sacrifier aux morts. On alloit même jusqu'à cet excès, de leur sacrifier des hommes vivans : on tuoit leurs esclaves, et même leurs femmes, pour les aller servir dans l'autre monde.[1]

Among more modern writers J. G. Müller, in his excellent "Geschichte der amerikanischen Urreligionen" (1855), clearly recognises "gespensterhafter Geisterglaube" as the foundation of all savage and semi-civilised theology, and I need do no more than mention the important developments of the same view which are to be found in Mr. Tylor's "Primitive Culture," and in the writings of Mr. Herbert Spencer, especially his recently-published "Ecclesiastical Institutions."[2]

[1] Œuvres de Bossuet, ed. 1808, t. xxxv. p. 282.

[2] I should like further to add the expression of my indebtedness to two works by Herr Julius Lippert, *Der Seelencult in seinen Beziehungen zur alt-hebraischen Religion*, and *Die Religionen der europäischen Culturvölker*, both published in 1881. I have found them full of valuable suggestions.

It is a matter of fact that, whether we direct our attention to the older conditions of civilised societies, in Japan, in China, in Hindostan, in Greece, or in Rome,[1] we find, underlying all other theological notions, the belief in ghosts, with its inevitable concomitant sorcery; and a primitive cult, in the shape of a worship of ancestors, which is essentially an attempt to please, or appease their ghosts. The same thing is true of old Mexico and Peru, and of all the semi-civilised or savage peoples who have developed a definite cult; and in those who, like the natives of Australia, have not even a cult, the belief in, and fear of, ghosts is as strong as anywhere else. The most clearly demonstrable article of the theology of the Israelites in the eleventh and twelfth centuries B.C. is therefore simply the article which is to be found in all primitive theologies, namely, the belief that a man has a soul which continues to exist after death for a longer or shorter time, and may return, as a ghost, with a divine, or at least demonic, character, to influence for good or evil (and usually for evil) the affairs of the living. But the correspondence between the old Israelitic and other archaic forms of theology extends to details. If, in order to avoid all chance of

[1] See among others the remarkable work of Fustel de Coulanges, *La Cité antique*, in which the social importance of the old Roman ancestor-worship is brought out with great clearness.

direct communication, we direct our attention to the theology of semi-civilised people, such as the Polynesian Islanders, separated by the greatest possible distance, and by every conceivable physical barrier, from the inhabitants of Palestine, we shall find not merely that all the features of old-Israelitic theology, which are revealed in the records cited, are found among them; but that extant information as to the inner mind of these people tends to remove many of the difficulties which those who have not studied anthropology find in the Hebrew narrative.

One of the best sources, if not the best source, of information on these topics is Mariner's *Tonga Islands*, which tells us of the condition of Cook's "Friendly Islanders" eighty years ago, before European influence was sensibly felt among them. Mariner, a youth of fair education and of no inconsiderable natural ability (as the work which was drawn up from the materials he furnished shows), was about fifteen years of age when his ship was attacked and plundered by the Tongans: he remained four years in the islands, familiarised himself with the language, lived the life of the people, became intimate with many of them, and had every opportunity of acquainting himself with their opinions, as well as with their habits and customs. He seems to have been devoid of prejudices, theological or other, and the impression of strict accuracy which his statements convey

has been justified by all the knowledge of Polynesian life which has been subsequently acquired.

It is desirable, therefore, to pay close attention to that which Mariner tells us about the theological views of these people :—

The human soul,[1] after its separation from the body, is termed a *hotooa* (a god or spirit), and is believed to exist in the shape of the body ; to have the same propensities as during life, but to be corrected by a more enlightened understanding, by which it readily distinguishes good from evil, truth from falsehood, right from wrong ; having the same attributes as the original gods, but in a minor degree, and having its dwelling for ever in the happy regions of Bolotoo, holding the same rank in regard to other souls as during this life ; it has, however, the power of returning to Tonga to inspire priests, relations, or others, or to appear in dreams to those it wishes to admonish ; and sometimes to the external eye in the form of a ghost or apparition ; but this power of reappearance at Tonga particularly belongs to the souls of chiefs rather than of matabooles (vol. ii. p. 130).

The word "hotooa" is the same as that which is usually spelt "atua" by Polynesian philologues, and it will be convenient to adopt this spelling. Now under this head of "*Atuas* or supernatural intelligent beings" the Tongans include :—

1. The original gods. 2. The souls of nobles that have all attributes in common with the first but inferior in degree. 3. The souls of matabooles[2] that are still inferior, and have not

[1] Supposed to be "the finer or more aeriform part of the body," standing in "the same relation to the body as the perfume and the more essential qualities of a flower do to the more solid substances" (Mariner, vol. ii. p. 127).

[2] A kind of "clients" in the Roman sense.

the power as the two first have of coming back to Tonga to inspire the priests, though they are supposed to have the power of appearing to their relatives. 4. The original attendants or servants, as it were, of the gods, who, although they had their origin and have ever since existed in Bolotoo, are still inferior to the third class. 5. The *Atua pow* or mischievous gods. 6. *Mooi*, or the god that supports the earth and does not belong to Bolotoo (vol. ii. pp. 103, 104).

From this it appears that the "Atuas" of the Polynesian are exactly equivalent to the "Elohim" of the old Israelite.[1] They comprise everything spiritual, from a ghost to a god, and from "the merely tutelar gods to particular private families" (vol. ii. p. 104), to Tá-li-y-Tooboó, who was the national god of Tonga. The Tongans had no doubt that these Atuas daily and hourly influenced their destinies and could, conversely, be influenced by them. Hence their "piety," the incessant acts of sacrificial worship which occupied their lives, and their belief in omens and charms. Moreover, the Atuas were believed to visit particular persons,—their own priests in the case of the higher gods, but apparently anybody in that of the lower,—and to inspire them by a process which was conceived to involve the actual residence of the god, for the time being, in the person inspired, who was thus rendered capable of prophesying (vol. ii. p. 100). For the

[1] It is worthy of remark that δαίμων among the Greeks, and *Deus* among the Romans, had the same wide signification The *dii manes* were ghosts of ancestors = Atuas of the family.

Tongan, therefore, inspiration indubitably was possession.

When one of the higher gods was invoked, through his priest, by a chief who wished to consult the oracle, or, in old Israelitic phraseology, to "inquire of," the god, a hog was killed and cooked over night, and, together with plantains, yams, and the materials for making the peculiar drink *kava* (of which the Tongans were very fond), was carried next day to the priest. A circle, as for an ordinary kava-drinking entertainment, was then formed; but the priest, as the representative of the god, took the highest place, while the chiefs sat outside the circle, as an expression of humility calculated to please the god.

As soon as they are all seated the priest is considered as inspired, the god being supposed to exist within him from that moment. He remains for a considerable time in silence with his hands clasped before him, his eyes are cast down and he rests perfectly still. During the time the victuals are being shared out and the kava preparing, the matabooles sometimes begin to consult him; sometimes he answers, and at other times not; in either case he remains with his eyes cast down. Frequently he will not utter a word till the repast is finished and the kava too. When he speaks he generally begins in a low and very altered tone of voice, which gradually rises to nearly its natural pitch, though sometimes a little above it. All that he says is supposed to be the declaration of the god, and he accordingly speaks in the first person, as if he were the god. All this is done generally without any apparent inward emotion or outward agitation; but, on some occasions, his countenance becomes fierce, and as it were inflamed, and his whole frame agitated with inward feeling; he is seized with an

universal trembling, the perspiration breaks out on his forehead, and his lips turning black are convulsed; at length tears start in floods from his eyes, his breast heaves with great emotion, and his utterance is choked. These symptoms gradually subside. Before this paroxysm comes on, and after it is over, he often eats as much as four hungry men under other circumstances could devour. The fit being now gone off, he remains for some time calm and then takes up a club that is placed by him for the purpose, turns it over and regards it attentively; he then looks up earnestly, now to the right, now to the left, and now again at the club; afterwards he looks up again and about him in like manner, and then again fixes his eyes on the club, and so on for several times. At length he suddenly raises the club, and, after a moment's pause, strikes the ground or the adjacent part of the house with considerable force; immediately the god leaves him, and he rises up and retires to the back of the ring among the people (vol. i. pp. 100, 101).

The phenomena thus described, in language which, to any one who is familiar with the manifestations of abnormal mental states among ourselves, bears the stamp of fidelity, furnish a most instructive commentary upon the story of the wise woman of Endor. As in the latter, we have the possession by the spirit or soul (Atua, Elohim), the strange voice, the speaking in the first person. Unfortunately nothing (beyond the loud cry) is mentioned as to the state of the wise woman of Endor. But what we learn from other sources (*e.g.* 1 Sam. x. 20-24) respecting the physical concomitants of inspiration among the old Israelites has its exact equivalent in this and other accounts of Polynesian prophetism. An

excellent authority, Moerenhout, who lived among the people of the Society Islands many years and knew them well, says that, in Tahiti, the *rôle* of the prophet had very generally passed out of the hands of the priests into that of private persons who professed to represent the god, often assumed his name, and in this capacity prophesied. I will not run the risk of weakening the force of Moerenhout's description of the prophetic state by translating it :—

Un individu, dans cet état, avait le bras gauche enveloppé d'un morceau d'étoffe, signe de la présence de la Divinité. Il ne parlait que d'un ton impérieux et véhément. Ses attaques, quand il allait prophétiser, étaient aussi effroyables qu'imposantes. Il tremblait d'abord de tous ses membres, la figure enflée, les yeux hagards, rouges et étincelants d'une expression sauvage. Il gesticulait, articulait des mots vides de sens, poussait des cris horribles qui faisaient tressaillir tous les assistants, et s'exaltait parfois au point qu'on n'osait pas l'approcher. Autour de lui, le silence de la terreur et du respect. . . . C'est alors qu'il répondait aux questions, annonçait l'avenir, le destin des batailles, la volonté des dieux ; et, chose étonnante ! au sein de ce délire, de cet enthousiasme religieux, son langage était grave, imposant, son éloquence noble et persuasive.[1]

Just so Saul strips off his clothes, "prophesies" before Samuel, and lies down "naked all that day and night."

Both Mariner and Moerenhout refuse to have recourse to the hypothesis of imposture in order to account for the inspired state of the Polynesian

[1] *Voyages aux îles du Grand Ocean*, t. i. p. 482.

prophets. On the contrary, they fully believe in their sincerity. Mariner tells the story of a young chief, an acquaintance of his, who thought himself possessed by the Atua of a dead woman who had fallen in love with him, and who wished him to die that he might be near her in Bolotoo. And he died accordingly. But the most valuable evidence on this head is contained in what the same authority says about King Finow's son. The previous king, Toogoo Ahoo, had been assassinated by Finow, and his soul, become an Atua of divine rank in Bolotoo, had been pleased to visit and inspire Finow's son—with what particular object does not appear.

When this young chief returned to Hapai, Mr. Mariner, who was upon a footing of great friendship with him, one day asked him how he felt himself when the spirit of Toogoo Ahoo visited him; he replied that he could not well describe his feelings, but the best he could say of it was, that he felt himself all over in a glow of heat and quite restless and uncomfortable, and did not feel his own personal identity, as it were, but seemed to have a mind different from his own natural mind, his thoughts wandering upon strange and unusual subjects, though perfectly sensible of surrounding objects. He next asked him how he knew it was the spirit of Toogoo Ahoo? His answer was, "There's a fool! How can I tell you *how* I knew it? I felt and knew it was so by a kind of consciousness; my *mind* told me that it was Toogoo Ahoo" (vol. i. pp. 104, 105).

Finow's son was evidently made for a theological disputant, and fell back at once on the inexpugnable stronghold of faith when other evidence was lacking. "There's a fool! I know it is true,

because I know it," is the exemplar and epitome of the sceptic-crushing process in other places than the Tonga Islands.

The island of Bolotoo, to which all the souls (of the upper classes at any rate) repair after the death of the body, and from which they return at will to interfere, for good or evil, with the lives of those whom they have left behind, obviously answers to Sheol. In Tongan tradition, this place of souls is a sort of elysium above ground and pleasant enough to live in. But, in other parts of Polynesia, the corresponding locality, which is called Po, has to be reached by descending into the earth, and is represented dark and gloomy like Sheol. But it was not looked upon as a place of rewards and punishments in any sense. Whether in Bolotoo or in Po, the soul took the rank it had in the flesh; and, a shadow, lived among the shadows of the friends and houses and food of its previous life.

The Tongan theologians recognised several hundred gods; but there was one, already mentioned as their national god, whom they regarded as far greater than any of the others, "as a great chief from the top of the sky down to the bottom of the earth" (Mariner, vol. ii. p. 106). He was also god of war, and the tutelar deity of the royal family, whoever happened to be the incumbent of the royal office for the time being. He had no priest except the king himself, and his visits, even

to royalty, were few and far between. The name of this supreme deity was Tá-li-y-Tooboó, the literal meaning of which is said to be "Wait there, Tooboó," from which it would appear that the peculiar characteristic of Tá-li-y-Tooboó, in the eyes of his worshippers, was persistence of duration. And it is curious to notice, in relation to this circumstance, that many Hebrew philologers have thought the meaning of Jahveh to be best expressed by the word "Eternal." It would probably be difficult to express the notion of an eternal being, in a dialect so little fitted to convey abstract conceptions as Tongan, better than by that of one who always "waits there."

The characteristics of the gods in Tongan theology are exactly those of men whose shape they are supposed to possess, only they have more intelligence and greater power. The Tongan belief that, after death, the human Atua more readily distinguishes good from evil, runs parallel with the old Israelitic conception of Elohim expressed in Genesis, "Ye shall be as Elohim, knowing good from evil." They further agreed with the old Israelites, that "all rewards for virtue and punishments for vice happen to men in this world only, and come immediately from the gods" (vol. ii. p. 100). Moreover, they were of opinion that though the gods approve of some kinds of virtue, are displeased with some kinds of vice, and, to a certain extent, protect or forsake

their worshippers according to their moral conduct, yet neglect to pay due respect to the deities, and forgetfulness to keep them in good humour, might be visited with even worse consequences than moral delinquency. And those who will carefully study the so-called "Mosaic code" contained in the books of Exodus, Leviticus, and Numbers, will see that, though Jahveh's prohibitions of certain forms of immorality are strict and sweeping, his wrath is quite as strongly kindled against infractions of ritual ordinances. Accidental homicide may go unpunished, and reparation may be made for wilful theft. On the other hand, Nadab and Abihu, who "offered strange fire before Jahveh, which he had not commanded them," were swiftly devoured by Jahveh's fire; he who sacrificed anywhere except at the allotted place was to be "cut off from his people"; so was he who eat blood; and the details of the upholstery of the Tabernacle, of the millinery of the priests' vestments, and of the cabinet work of the ark, can plead direct authority from Jahveh, no less than moral commands.

Amongst the Tongans, the sacrifices were regarded as gifts of food and drink offered to the divine Atuas, just as the articles deposited by the graves of the recently dead were meant as food for Atuas of lower rank. A kava root was a constant form of offering all over Polynesia. In the excellent work of the Rev. George Turner,

entitled *Nineteen Years in Polynesia* (p. 241), I find it said of the Samoans (near neighbours of the Tongans) :—

> *The offerings* were principally cooked food. As in ancient Greece so in Samoa, the first cup was in honour of the god. It was either poured out on the ground or *waved* towards the heavens, reminding us again of the Mosaic ceremonies. The chiefs all drank a portion out of the same cup, according to rank ; and after that, the food brought as an offering was divided and eaten "*there before the Lord.*"

In Tonga, when they consulted a god who had a priest, the latter, as representative of the god, had the first cup ; but if the god, like Tá-li-y-Tooboó, had no priest, then the chief place was left vacant, and was supposed to be occupied by the god himself. When the first cup of kava was filled, the mataboole who acted as master of the ceremonies said, "Give it to your god," and it was offered, though only as a matter of form. In Tonga and Samoa there were many sacred places or *morais*, with houses of the ordinary construction, but which served as temples in consequence of being dedicated to various gods ; and there were altars on which the sacrifices were offered ; nevertheless there were few or no images. Mariner mentions none in Tonga, and the Samoans seem to have been regarded as no better than atheists by other Polynesians because they had none. It does not appear that either of these peoples had images even of their family or ancestral gods.

In Tahiti and the adjacent islands, Moerenhout (t. i. p. 471) makes the very interesting observation, not only that idols were often absent, but that, where they existed, the images of the gods served merely as depositories for the proper representatives of the divinity. Each of these was called a *maro aurou*, and was a kind of girdle artistically adorned with red, yellow, blue, and black feathers—the red feathers being especially important—which were consecrated and kept as sacred objects within the idols. They were worn by great personages on solemn occasions, and conferred upon their wearers a sacred and almost divine character. There is no distinct evidence that the *maro aurou* was supposed to have any special efficacy in divination, but one cannot fail to see a certain parallelism between this holy girdle, which endowed its wearer with a particular sanctity, and the ephod.

According to the Rev. R. Taylor, the New Zealanders formerly used the word *karakia* (now employed for "prayer") to signify a "spell, charm, or incantation," and the utterance of these karakias constituted the chief part of their cult. In the south, the officiating priest had a small image, "about eighteen inches long, resembling a peg with a carved head," which reminds one of the form commonly attributed to the teraphim.

The priest first bandaged a fillet of red parrot feathers under the god's chin, which was called his pahau or beard; this

bandage was made of a certain kind of sennet, which was tied on in a peculiar way. When this was done it was taken possession of by the Atua, whose spirit entered it. The priest then either held it in the hand and vibrated it in the air, whilst the powerful karakia was repeated, or he tied a piece of string (formed of the centre of a flax leaf) round the neck of the image and stuck it in the ground. He sat at a little distance from it, leaning against a tuahu, a short stone pillar stuck in the ground in a slanting position and, holding the string in his hand, he gave the god a jerk to arrest his attention, lest he should be otherwise engaged, like Baal of old, either hunting, fishing, or sleeping, and therefore must be awaked. . . . The god is supposed to make use of the priest's tongue in giving a reply. Image-worship appears to have been confined to one part of the island. The Atua was supposed only to enter the image for the occasion. The natives declare they did not worship the image itself, but only the Atua it represented, and that the image was merely used as a way of approaching him.[1]

This is the excuse for image-worship which the more intelligent idolaters make all the world over; but it is more interesting to observe that, in the present case, we seem to have the equivalents of divination by teraphim, with the aid of something like an ephod (which, however, is used to sanctify the image and not the priest) mixed up together. Many Hebrew archæologists have supposed that the term "ephod" is sometimes used for an image (particularly in the case of Gideon's ephod), and the story of Micah, in the book of Judges, shows that images were, at any rate, employed in close association with the ephod. If the pulling of the

[1] *Te Ika a Maui: New Zealand and its Inhabitants*, p. 72.

string to call the attention of the god seems as absurd to us as it appears to have done to the worthy missionary, who tells us of the practice, it should be recollected that the high priest of Jahveh was ordered to wear a garment fringed with golden bells.

> And it shall be upon Aaron to minister; and the sound thereof shall be heard when he goeth in unto the holy place before Jahveh, and when he cometh out, that he die not (Exod. xxviii. 35).

An escape from the obvious conclusion suggested by this passage has been sought in the supposition that these bells rang for the sake of the worshippers, as at the elevation of the host in the Roman Catholic ritual; but then why should the priest be threatened with the well-known penalty for inadvisedly beholding the divinity?

In truth, the intermediate step between the Maori practice and that of the old Israelites is furnished by the Kami temples in Japan. These are provided with bells which the worshippers who present themselves ring, in order to call the attention of the ancestor-god to their presence. Grant the fundamental assumption of the essentially human character of the spirit, whether Atua, Kami, or Elohim, and all these practices are equally rational.

The sacrifices to the gods in Tonga, and elsewhere in Polynesia, were ordinarily social gatherings, in which the god, either in his own person or in

that of his priestly representative, was supposed to take part. These sacrifices were offered on every occasion of importance, and even the daily meals were prefaced by oblations and libations of food and drink, exactly answering to those offered by the old Romans to their manes, penates, and lares. The sacrifices had no moral significance, but were the necessary result of the theory that the god was either a deified ghost of an ancestor or chief, or, at any rate, a being of like nature to these. If one wanted to get anything out of him, therefore, the first step was to put him in good humour by gifts; and if one desired to escape his wrath, which might be excited by the most trifling neglect or unintentional disrespect, the great thing was to pacify him by costly presents. King Finow appears to have been somewhat of a freethinker (to the great horror of his subjects), and it was only his untimely death which prevented him from dealing with the priest of a god, who had not returned a favourable answer to his supplications, as Saul dealt with the priests of the sanctuary of Jahveh at Nob. Nevertheless, Finow showed his practical belief in the gods during the sickness of a daughter, to whom he was fondly attached, in a fashion which has a close parallel in the history of Israel.

If the gods have any resentment against us, let the whole weight of vengeance fall on my head. I fear not their vengeance—but spare my child; and I earnestly entreat you, Toobo

Totái [the god whom he had evoked], to exert all your influence with the other gods that I alone may suffer all the punishment they desire to inflict (vol. i. p. 354).

So when the king of Israel has sinned by "numbering the people," and they are punished for his fault by a pestilence which slays seventy thousand innocent men, David cries to Jahveh :—

Lo, I have sinned, and I have done perversely: but these sheep, what have they done? let thine hand, I pray thee, be against me, and against my father's house (2 Sam. xxiv. 17).

Human sacrifices were extremely common in Polynesia; and, in Tonga, the "devotion" of a child by strangling was a favourite method of averting the wrath of the gods. The well-known instances of Jephthah's sacrifice of his daughter and of David's giving up the seven sons of Saul to be sacrificed by the Gibeonites "before Jahveh," appear to me to leave no doubt that the old Israelites, even when devout worshippers of Jahveh, considered human sacrifices, under certain circumstances, to be not only permissible but laudable. Samuel's hewing to pieces of the miserable captive, sole survivor of his nation, Agag, "before Jahveh," can hardly be viewed in any other light. The life of Moses is redeemed from Jahveh, who "sought to slay him," by Zipporah's symbolical sacrifice of her child, by the bloody operation of circumcision. Jahveh expressly affirms that the first-born males of men and beasts

are devoted to him; in accordance with that claim, the first-born males of the beasts are duly sacrificed; and it is only by special permission that the claim to the first-born of men is waived, and it is enacted that they may be redeemed (Exod. xiii. 12-15). Is it possible to avoid the conclusion that immolation of their first-born sons would have been incumbent on the worshippers of Jahveh, had they not been thus specially excused? Can any other conclusion be drawn from the history of Abraham and Isaac? Does Abraham exhibit any indication of surprise when he receives the astounding order to sacrifice his son? Is there the slightest evidence that there was anything in his intimate and personal acquaintance with the character of the Deity, who had eaten the meat and drunk the milk which Abraham set before him under the oaks of Mamre, to lead him to hesitate —even to wait twelve or fourteen hours for a repetition of the command? Not a whit. We are told that "Abraham rose early in the morning" and led his only child to the slaughter, as if it were the most ordinary business imaginable. Whether the story has any historical foundation or not, it is valuable as showing that the writer of it conceived Jahveh as a deity whose requirement of such a sacrifice need excite neither astonishment nor suspicion of mistake on the part of his devotee. Hence, when the incessant human sacrifices in Israel, during the age of the kings, are put down

to the influence of foreign idolatries, we may fairly inquire whether editorial Bowdlerising has not prevailed over historical truth.

An attempt to compare the ethical standards of two nations, one of which has a written code, while the other has not, is beset with difficulties. With all that is strange and, in many cases, repulsive to us in the social arrangements and opinions respecting moral obligation among the Tongans, as they are placed before us, with perfect candour, in Mariner's account, there is much that indicates a strong ethical sense. They showed great kindliness to one another, and faithfulness in standing by their comrades in war. No people could have better observed either the third or the fifth commandment; for they had a particular horror of blasphemy, and their respectful tenderness towards their parents and, indeed, towards old people in general, was remarkable.

It cannot be said that the eighth commandment was generally observed, especially where Europeans were concerned; nevertheless a well-bred Tongan looked upon theft as a meanness to which he would not condescend. As to the seventh commandment, any breach of it was considered scandalous in women and as something to be avoided in self-respecting men; but, among unmarried and widowed people, chastity was held very cheap. Nevertheless the women were extremely well treated, and often showed them-

selves capable of great devotion and entire faithfulness. In the matter of cruelty, treachery, and bloodthirstiness, these islanders were neither better nor worse than most peoples of antiquity. It is to the credit of the Tongans that they particularly objected to slander; nor can covetousness be regarded as their characteristic; for Mariner says:—

> When any one is about to eat, he always shares out what he has to those about him, without any hesitation, and a contrary conduct would be considered exceedingly vile and selfish (vol. ii. p. 145).

In fact, they thought very badly of the English when Mariner told them that his countrymen did not act exactly on that principle. It further appears that they decidedly belonged to the school of intuitive moral philosophers, and believed that virtue is its own reward; for

> Many of the chiefs, on being asked by Mr. Mariner what motives they had for conducting themselves with propriety, besides the fear of misfortunes in this life, replied, the agreeable and happy feeling which a man experiences within himself when he does any good action or conducts himself nobly and generously as a man ought to do; and this question they answered as if they wondered such a question should be asked (vol. ii. p. 161).

One may read from the beginning of the book of Judges to the end of the books of Samuel without discovering that the old Israelites had a moral standard which differs, in any essential respect

(except perhaps in regard to the chastity of unmarried women), from that of the Tongans. Gideon, Jephthah, Samson, and David are strong-handed men, some of whom are not outdone by any Polynesian chieftain in the matter of murder and treachery; while Deborah's jubilation over Jael's violation of the primary duty of hospitality, proffered and accepted under circumstances which give a peculiarly atrocious character to the murder of the guest; and her witch-like gloating over the picture of the disappointment of the mother of the victim—

> The mother of Sisera cried through the lattice,
> Why is his chariot so long in coming? (Jud. v. 28.)

—would not have been out of place in the choral service of the most sanguinary god in the Polynesian pantheon.

With respect to the cannibalism which the Tongans occasionally practised, Mariner says:—

> Although a few young ferocious warriors chose to imitate what they considered a mark of courageous fierceness in a neighbouring nation, it was held in disgust by everybody else (vol. ii. p. 171).

That the moral standard of Tongan life was less elevated than that indicated in the "Book of the Covenant" (Exod. xxi.-xxiii.) may be freely admitted. But then the evidence that this Book of the Covenant, and even the ten commandments as given in Exodus, were known to the Israelites

of the time of Samuel and Saul, is (to say the least) by no means conclusive. The Deuteronomic version of the fourth commandment is hopelessly discrepant from that which stands in Exodus. Would any later writer have ventured to alter the commandments as given from Sinai, if he had had before him that which professed to be an accurate statement of the "ten words" in Exodus? And if the writer of Deuteronomy had not Exodus before him, what is the value of the claim of the version of the ten commandments therein contained to authenticity? From one end to the other of the books of Judges and Samuel, the only "commandments of Jahveh" which are specially adduced refer to the prohibition of the worship of other gods, or are orders given *ad hoc*, and have nothing to do with questions of morality.

In Polynesia, the belief in witchcraft, in the appearance of spiritual beings in dreams, in possession as the cause of diseases, and in omens, prevailed universally. Mariner tells a story of a woman of rank who was greatly attached to King Finow, and who, for the space of six months after his death, scarcely ever slept elsewhere than on his grave, which she kept carefully decorated with flowers :—

> One day she went, with the deepest affliction, to the house of Mo-oonga Toobó, the widow of the deceased chief, to communicate what had happened to her at the *fytoca* [grave] during several nights, and which caused her the greatest anxiety.

She related that she had dreamed that the late How [King] appeared to her and, with a countenance full of disappointment, asked why there yet remained at Vavaoo so many evil-designing persons: for he declared that, since he had been at Bolotoo, his spirit had been disturbed[1] by the evil machinations of wicked men conspiring against his son; but he declared that "the youth" should not be molested nor his power shaken by the spirit of rebellion; that he therefore came to her with a warning voice to prevent such disastrous consequences (vol. i. p. 424).

On inquiry it turned out that the charm of *tattao* had been performed on Finow's grave, with the view of injuring his son, the reigning king, and it is to be presumed that it was this sorcerer's work which had "disturbed" Finow's spirit. The Rev. Richard Taylor says in the work already cited: "The account given of the witch of Endor agrees most remarkably with the witches of New Zealand" (p. 45).

The Tongans also believed in a mode of divination (essentially similar to the casting of lots) the twirling of a cocoanut.

The object of inquiry . . . is chiefly whether a sick person will recover; for this purpose the nut being placed on the ground, a relation of the sick person determines that, if the nut, when again at rest, points to such a quarter, the east for example, that the sick man will recover; he then prays aloud to the patron god of the family that he will be pleased to direct the nut so that it may indicate the truth; the nut being next spun, the result is attended to with confidence, at least with a full conviction that it will truly declare the intentions of the gods at the time (vol. ii. p. 227).

[1] Compare: "And Samuel said unto Saul, Why hast thou disquieted me?" (1 Sam. xxviii. 15.)

Does not the action of Saul, on a famous occasion, involve exactly the same theological presuppositions?

> Therefore Saul said unto Jahveh, the Elohim of Israel, Shew the right. And Jonathan and Saul were taken *by lot:* but the people escaped. And Saul said, Cast *lots* between me and Jonathan my son. And Jonathan was taken. And Saul said to Jonathan, Tell me what thou hast done. . . . And the people rescued Jonathan so that he died not (1 Sam. xiv. 41–45).

As the Israelites had great yearly feasts, so had the Polynesians; as the Israelites practised circumcision, so did many Polynesian people; as the Israelites had a complex and often arbitrary-seeming multitude of distinctions between clean and unclean things, and clean and unclean states of men, to which they attached great importance, so had the Polynesians their notions of ceremonial purity and their *tabu*, an equally extensive and strange system of prohibitions, violation of which was visited by death. These doctrines of cleanness and uncleanness no doubt may have taken their rise in the real or fancied utility of the prescriptions, but it is probable that the origin of many is indicated in the curious habit of the Samoans to make fetishes of living animals. It will be recollected that these people had no "gods made with hands," but they substituted animals for them.

At his birth

> every Samoan was supposed to be taken under the care of some tutelary god or *aitu* [= Atua] as it was called. The help of

perhaps half a dozen different gods was invoked in succession on the occasion, but the one who happened to be addressed just as the child was born was marked and declared to be the child's god for life.

These gods were supposed to appear in some *visible incarnation*, and the particular thing in which his god was in the habit of appearing was, to the Samoan, an object of veneration. It was in fact his idol, and he was careful never to injure it or treat it with contempt. One, for instance, saw his god in the eel, another in the shark, another in the turtle, another in the dog, another in the owl, another in the lizard; and so on, throughout all the fish of the sea and birds and four-footed beasts and creeping things. In some of the shell-fish even, gods were supposed to be present. A man would eat freely of what was regarded as the incarnation of the god of another man, but the incarnation of his own particular god he would consider it death to injure or eat.[1]

We have here that which appears to be the origin, or one of the origins, of food prohibitions, on the one hand, and of totemism on the other. When it is remembered that the old Israelites sprang from ancestors who are said to have resided near, or in, one of the great seats of ancient Babylonian civilisation, the city of Ur; that they had been, it is said for centuries, in close contact with the Egyptians; and that, in the theology of both the Babylonians and the Egyptians, there is abundant evidence, notwithstanding their advanced social organisation, of the belief in spirits, with sorcery, ancestor-worship, the deification of animals, and the converse animalisation of gods—it obviously needs very strong evidence to justify the

[1] Turner, *Nineteen Years in Polynesia*, p. 238.

belief that the rude tribes of Israel did not share the notions from which their far more civilised neighbours had not emancipated themselves.

But it is surely needless to carry the comparison further. Out of the abundant evidence at command, I think that sufficient has been produced to furnish ample grounds for the belief, that the old Israelites of the time of Samuel entertained theological conceptions which were on a level with those current among the more civilised of the Polynesian islanders, though their ethical code may possibly, in some respects, have been more advanced.[1]

A theological system of essentially similar character, exhibiting the same fundamental conceptions respecting the continued existence and incessant interference in human affairs of disembodied spirits, prevails, or formerly prevailed, among the whole of the inhabitants of the Polynesian and Melanesian islands, and among the people of Australia, notwithstanding the wide differences in physical character and in grade of civilisation which obtain among them. And the same proposition is true of the people who inhabit the riverain shores of the Pacific Ocean, whether Dyaks, Malays, Indo-Chinese, Chinese, Japanese, the wild tribes of America, or the highly civilised old Mexicans and Peruvians. It is no less true of the Mongolic

[1] See Lippert's excellent remarks on this subject, *Der Seelencult*, p. 89.

nomads of Northern Asia, of the Asiatic Aryans and of the Ancient Greeks and Romans, and it holds good among the Dravidians of the Dekhan and the negro tribes of Africa. No tribe of savages, which has yet been discovered, has been conclusively proved to have so poor a theological equipment as to be devoid of a belief in ghosts, and in the utility of some form of witchcraft, in influencing those ghosts. And there is no nation, modern or ancient, which, even at this moment, has wholly given up the belief; and in which it has not, at one time or other, played a great part in practical life.

This *sciotheism*,[1] as it might be called, is found, in several degrees of complexity, in rough correspondence with the stages of social organisation, and, like these, separated by no sudden breaks.

In its simplest condition, such as may be met with among the Australian savages, theology is a mere belief in the existence, powers, and disposition (usually malignant) of ghostlike entities who may be propitiated or scared away; but no cult can properly be said to exist. And, in this stage, theology is wholly independent of ethics. The moral code, such as is implied by public opinion, derives no sanction from the theological dogmas,

[1] *Sciography* has the authority of Cudworth, *Intellectual System*, vol. ii. p. 836. Sciomancy (σκιομαντεία), which, in the sense of divination by ghosts, may be found in Bailey's *Dictionary* (1751), also furnishes a precedent for my coinage.

and the influence of the spirits is supposed to be exerted out of mere caprice or malice.

As a next stage, the fundamental fear of ghosts and the consequent desire to propitiate them acquire an organised ritual in simple forms of ancestor-worship, such as the Rev. Mr. Turner describes among the people of Tanna (*l.c.* p. 88); and this line of development may be followed out until it attains its acme in the State-theology of China and the Kami-theology [1] of Japan. Each of these is essentially ancestor-worship, the ancestors being reckoned back through family groups, of higher and higher order, sometimes with strict reference to the principle of agnation, as in old Rome; and, as in the latter, it is intimately bound up with the whole organisation of the State. There are no idols; inscribed tablets in China, and strips of paper lodged in a peculiar portable shrine in Japan, represent the souls of the deceased, or the special seats which they occupy when sacrifices are offered by their descendants. In Japan it is interesting to observe that a national Kami—Ten-zio-dai-zin—is worshipped as a sort of Jahveh by the nation in general, and (as Lippert has observed) it is singular that his special seat is a portable litter-like shrine, termed the Mikosi, in some sort analogous to the Israelitic ark. In China, the emperor

[1] "Kami" is used in the sense of Elohim; and is also, like our word "Lord," employed as a title of respect among men, as indeed Elohim was.

is the representative of the primitive ancestors, and stands, as it were, between them and the supreme cosmic deities—Heaven and Earth—who are superadded to them, and who answer to the Tangaloa and the Maui of the Polynesians.

Sciotheism, under the form of the deification of ancestral ghosts, in its most pronounced form, is therefore the chief element in the theology of a great moiety, possibly of more than half, of the human race. I think this must be taken to be a matter of fact—though various opinions may be held as to how this ancestor-worship came about. But on the other hand, it is no less a matter of fact that there are very few people without additional gods, who cannot, with certainty, be accounted for as deified ancestors.

With all respect for the distinguished authorities on the other side, I cannot find good reasons for accepting the theory that the cosmic deities—who are superadded to deified ancestors even in China; who are found all over Polynesia, in Tangaloa and Maui, and in old Peru, in the Sun—are the product either of the "search after the infinite," or of mistakes arising out of the confusion of a great chief's name with the thing signified by the name. But, however this may be, I think it is again merely matter of fact that, among a large portion of mankind, ancestor-worship is more or less thrown into the background either by such cosmic deities, or by tribal gods of uncertain

origin, who have been raised to eminence by the superiority in warfare, or otherwise, of their worshippers.

Among certain nations, the polytheistic theology, thus constituted, has become modified by the selection of some one cosmic or tribal god, as the only god to whom worship is due on the part of that nation (though it is by no means denied that other nations have a right to worship other gods), and thus results a worship of one God—*monolatry*, as Wellhausen calls it—which is very different from genuine monotheism.[1] In ancestral sciotheism, and in this *monolatry*, the ethical code, often of a very high order, comes into closer relation with the theological creed. Morality is taken under the patronage of the god or gods, who reward all morally good conduct and punish all morally evil conduct in this world or the next. At the same time, however, they are conceived to be thoroughly human, and they visit any shadow of disrespect to themselves, shown by disobedience to their commands, or by delay, or carelessness, in carrying them out, as severely as any breach of the moral laws. Piety means minute attention to the due performance of all sacred rites, and covers any number of lapses in morality, just as cruelty, treachery, murder, and adultery did not bar David's claim to the title of the man after God's own

[1 The Assyrians thus raised Assur to a position of pre-eminence.]

heart among the Israelites; crimes against men may be expiated, but blasphemy against the gods is an unpardonable sin. Men forgive all injuries but those which touch their self-esteem; and they make their gods after their own likeness, in their own image make they them.

It is in the category of monolatry that I conceive the theology of the old Israelites must be ranged. They were polytheists, in so far as they admitted the existence of other Elohim of divine rank beside Jahveh; they differed from ordinary polytheists, in so far as they believed that Jahveh was the supreme god and the one proper object of their own national worship. But it will doubtless be objected that I have been building up a fictitious Israelitic theology on the foundation of the recorded habits and customs of the people, when they had lapsed from the ordinances of their great lawgiver and prophet Moses, and that my conclusions may be good for the perverts to Canaanitish theology, but not for the true observers of the Sinaitic legislation. The answer to the objection is that—so far as I can form a judgment of that which is well ascertained in the history of Israel—there is very little ground for believing that we know much, either about the theological and social value of the influence of Moses, or about what happened during the wanderings in the Desert.

The account of the Exodus and of the occurrences in the Sinaitic peninsula; in fact, all the history of Israel before the invasion of Canaan, is full of wonderful stories, which may be true, in so far as they are conceivable occurrences, but which are certainly not probable, and which I, for one, decline to accept until evidence, which deserves that name, is offered of their historical truth. Up to this time I know of none.[1] Furthermore, I see no answer to the argument that one has no right to pick out of an obviously unhistorical statement the assertions which happen to be probable and to discard the rest. But it is also certain that a primitively veracious tradition may be smothered under subsequent mythical additions, and that one has no right to cast away the former along with the latter. Thus, perhaps the fairest way of stating the case may be as follows.

There can be no *a priori* objection to the supposition that the Israelites were delivered from their Egyptian bondage by a leader called Moses, and that he exerted a great influence over their subsequent organisation in the Desert. There is no reason to doubt that, during their residence in the land of Goshen, the Israelites knew nothing of Jahveh; but, as their own prophets declare (see Ezek. xx.), were polytheistic idolaters, sharing in

[1] I refer those who wish to know the reasons which lead me to take up this position to the works of Reuss and Wellhausen, [and especially to Stade's *Geschichte des Volkes Israel.*]

the worst practices of their neighbours. As to their conduct in other respects, nothing is known. But it may fairly be suspected that their ethics were not of a higher order than those of Jacob, their progenitor, in which case they might derive great profit from contact with Egyptian society, which held honesty and truthfulness in the highest esteem. Thanks to the Egyptologers, we now know, with all requisite certainty, the moral standard of that society in the time, and long before the time, of Moses. It can be determined from the scrolls buried with the mummified dead and from the inscriptions on the tombs and memorial statues of that age. For, though the lying of epitaphs is proverbial, so far as their subject is concerned, they gave an unmistakable insight into that which the writers and the readers of them think praiseworthy.

In the famous tombs at Beni Hassan there is a record of the life of Prince Nakht, who served Osertasen II., a Pharaoh of the twelfth dynasty as governor of a province. The inscription speaks in his name: "I was a benevolent and kindly governor who loved his country. . . . Never was a little child distressed nor a widow ill-treated by me. I have never repelled a workman nor hindered a shepherd. I gave alike to the widow and to the married woman, and have not preferred the great to the small in my gifts." And we have the high authority of the late Dr. Samuel Birch for

the statement that the inscriptions of the twelfth dynasty abound in injunctions of a high ethical character. "To feed the hungry, give drink to the thirsty, clothe the naked, bury the dead, loyally serve the king, formed the first duty of a pious man and faithful subject."[1] The people for whom these inscriptions embodied their ideal of praiseworthiness assuredly had no imperfect conception of either justice or mercy. But there is a document which gives still better evidence of the moral standard of the Egyptians. It is the "Book of the Dead," a sort of "Guide to Spiritland," the whole, or a part, of which was buried with the mummy of every well-to-do Egyptian, while extracts from it are found in innumerable inscriptions. Portions of this work are of extreme antiquity, evidence of their existence occurring as far back as the fifth and sixth dynasties; while the 125th chapter, which constitutes a sort of book by itself, and is known as the "Book of Redemption in the Hall of the two Truths," is frequently inscribed upon coffins and other monuments of the nineteenth dynasty (that under which, there is some reason to believe, the Israelites were oppressed and the Exodus took place), and it occurs, more than once, in the famous tombs of the kings of this and the preceding dynasty at Thebes.[2] This

[1] Bunsen, *Egypt's Place*, vol. v. p. 129, note.
[2] See Birch, in *Egypt's Place*, vol. v.; and Brugsch, *History of Egypt*.

"Book of Redemption" is chiefly occupied by the so-called "negative confession" made to the forty-two Divine Judges, in which the soul of the dead denies that he has committed faults of various kinds. It is, therefore, obvious that the Egyptians conceived that their gods commanded them not to do the deeds which are here denied. The "Book of Redemption," in fact, implies the existence in the mind of the Egyptians, if not in a formal writing, of a series of ordinances, couched, like the majority of the ten commandments, in negative terms. And it is easy to prove the implied existence of a series which nearly answers to the "ten words." Of course a polytheistic and image-worshipping people, who observed a great many holy days, but no Sabbaths, could have nothing analogous to the first or the second and the fourth commandments of the Decalogue; but answering to the third, is "I have not blasphemed;" to the fifth, "I have not reviled the face of the king or my father;" to the sixth, "I have not murdered;" to the seventh, "I have not committed adultery;" to the eighth, "I have not stolen," "I have not done fraud to man;" to the ninth, "I have not told falsehoods in the tribunal of truth," and, further, "I have not calumniated the slave to his master." I find nothing exactly similar to the tenth commandment; but that the inward disposition of mind was held to be of no less importance than the outward act is to be gathered from the

praises of kindliness already cited and the cry of "I am pure," which is repeated by the soul on trial. Moreover, there is a minuteness of detail in the confession which shows no little delicacy of moral appreciation—"I have not privily done evil against mankind," "I have not afflicted men," "I have not withheld milk from the mouths of sucklings," "I have not been idle," "I have not played the hypocrite," "I have not told falsehoods," "I have not corrupted woman or man," "I have not caused fear," "I have not multiplied words in speaking."

Would that the moral sense of the nineteenth century A.D. were as far advanced as that of the Egyptians in the nineteenth century B.C. in this last particular! What incalculable benefit to mankind would flow from strict observance of the commandment, "Thou shalt not multiply words in speaking!" Nothing is more remarkable than the stress which the old Egyptians, here and elsewhere, lay upon this and other kinds of truthfulness, as compared with the absence of any such requirement in the Israelitic Decalogue, in which only a specific kind of untruthfulnes is forbidden.

If, as the story runs, Moses was adopted by a princess of the royal house, and was instructed in all the wisdom of the Egyptians, it is surely incredible that he should not have been familiar from his youth up, with the high moral code implied in the "Book of Redemption." It is

surely impossible that he should have been less familiar with the complete legal system, and with the method of administration of justice, which, even in his time, had enabled the Egyptian people to hold together, as a complex social organisation, for a period far longer than the duration of old Roman society, from the building of the city to the death of the last Cæsar. Nor need we look to Moses alone for the influence of Egypt upon Israel. It is true that the Hebrew nomads who came into contact with the Egyptians of Osertasen, or of Ramses, stood in much the same relation to them, in point of culture, as a Germanic tribe did to the Romans of Tiberius, or of Marcus Antoninus; or as Captain Cook's Omai did to the English of George the Third. But, at the same time, any difficulty of communication which might have arisen out of this circumstance was removed by the long pre-existing intercourse of other Semites, of every grade of civilisation, with the Egyptians. In Mesopotamia and elsewhere, as in Phenicia, Semitic people had attained to a social organisation as advanced as that of the Egyptians; Semites had conquered and occupied Lower Egypt for centuries. So extensively had Semitic influences penetrated Egypt that the Egyptian language, during the period of the nineteenth dynasty, is said by Brugsch to be as full of Semitisms as German is of Gallicisms; while Semitic deities had supplanted the Egyptian gods at Heliopolis and else-

where. On the other hand, the Semites, as far as Phenicia, were extensively influenced by Egypt.

It is generally admitted[1] that Moses, Phinehas (and perhaps Aaron), are names of Egyptian origin, and there is excellent authority for the statement that the name *Abir*, which the Israelites gave to their golden calf, and which is also used to signify the strong, the heavenly, and even God,[2] is simply the Egyptian Apis. Brugsch points out that the god, Tum or Tom, who was the special object of worship in the city of Pi-Tom, with which the Israelites were only too familiar, was called Ānkh and the "great god," and had no image. Ānhk means "He who lives," "the living one," a name the resemblance of which to the "I am that I am" of Exodus is unmistakable, whatever may be the value of the fact. Every discussion of Israelitic ritual seeks and finds the explanation of its details in the portable sacred chests, the altars, the priestly dress, the breastplate, the incense, and the sacrifices depicted on the monuments of Egypt. But it must be remembered that these signs of the influence of Egypt upon Israel are not necessarily evidence that such influence was exerted before the Exodus. It may have come much later, through the close connection of the

[1] Even by Graetz, who, though a fair enough historian, cannot be accused of any desire to over-estimate the importance of Egyptian influence upon his people.

[2] Graetz, *Geschichte der Juden*, Bd. i. p. 370.

Israel, of David and Solomon, first with Phenicia and then with Egypt.

If we suppose Moses to have been a man of the stamp of Calvin, there is no difficulty in conceiving that he may have constructed the substance of the ten words, and even of the Book of the Covenant, which curiously resembles parts of the Book of the Dead, from the foundation of Egyptian ethics and theology which had filtered through to the Israelites in general, or had been furnished specially to himself by his early education; just as the great Genevese reformer built up a puritanic social organisation on so much as remained of the ethics and theology of the Roman Church, after he had trimmed them to his liking.

Thus, I repeat, I see no *a priori* objection to the assumption that Moses may have endeavoured to give his people a theologico-political organisation based on the ten commandments (though certainly not quite in their present form) and the Book of the Covenant, contained in our present book of Exodus. But whether there is such evidence as amounts to proof, or, I had better say, to probability, that even this much of the Pentateuch owes its origin to Moses is another matter. The mythical character of the accessories of the Sinaitic history is patent, and it would take a good deal more evidence than is afforded by the bare assertion of an unknown writer to justify the

belief that the people who "saw the thunderings and the lightnings and the voice of the trumpet and the mountain smoking" (Exod. xx. 18); to whom Jahveh orders Moses to say, "Ye yourselves have seen that I have talked with you from heaven. Ye shall not make other gods with me; gods of silver and gods of gold ye shall not make unto you" (*ibid.* 22, 23), should, less than six weeks afterwards, have done the exact thing they were thus awfully forbidden to do. Nor is the credibility of the story increased by the statement that Aaron, the brother of Moses, the witness and fellow-worker of the miracles before Pharaoh, was their leader and the artificer of the idol. And yet, at the same time, Aaron was apparently so ignorant of wrongdoing that he made proclamation, "To-morrow shall be a feast to Jahveh," and the people proceeded to offer their burnt-offerings and peace-offerings, as if everything in their proceedings must be satisfactory to the Deity with whom they had just made a solemn covenant to abolish image-worship. It seems to me that, on a survey of all the facts of the case, only a very cautious and hypothetical judgment is justifiable. It may be that Moses profited by the opportunities afforded him of access to what was best in Egyptian society to become acquainted, not only with its advanced ethical and legal code, but with the more or less pantheistic unification of the Divine to which the speculations of the Egyptian

thinkers, like those of all polytheistic philosophers, from Polynesia to Greece, tend; if indeed the theology of the period of the nineteenth dynasty was not, as some Egyptologists think, a modification of an earlier, more distinctly monotheistic doctrine of a long antecedent age. It took only half a dozen centuries for the theology of Paul to become the theology of Gregory the Great; and it is possible that twenty centuries lay between the theology of the first worshippers in the sanctuary of the Sphinx and that of the priests of Ramses Maimun.

It may be that the ten commandments and the Book of the Covenant are based upon faithful traditions of the efforts of a great leader to raise his followers to his own level. For myself, as a matter of pious opinion, I like to think so; as I like to imagine that, between Moses and Samuel, there may have been many a seer, many a herdsman such as him of Tekoah, lonely amidst the hills of Ephraim and Judah, who cherished and kept alive these traditions. In the present results of Biblical criticism, however, I can discover no justification for the common assumption that, between the time of Joshua and that of Rehoboam, the Israelites were familiar with either the Deuteronomic or the Levitical legislation; or that the theology of the Israelites, from the king who sat on the throne to the lowest of his subjects, was in any important respect different from that which

might naturally be expected from their previous history and the conditions of their existence. But there is excellent evidence to the contrary effect. And, for my part, I see no reason to doubt that, like the rest of the world, the Israelites had passed through a period of mere ghost-worship, and had advanced through Ancestor-worship and Fetishism and Totemism to the theological level at which we find them in the books of Judges and Samuel.

All the more remarkable, therefore, is the extraordinary change which is to be noted in the eighth century B.C. The student who is familiar with the theology implied, or expressed, in the books of Judges, Samuel, and the first book of Kings, finds himself in a new world of thought, in the full tide of a great reformation, when he reads Joel, Amos, Hosea, Isaiah, Micah, and Jeremiah.

The essence of this change is the reversal of the position which, in primitive society, ethics holds in relation to theology. Originally, that which men worship is a theological hypothesis, not a moral ideal. The prophets, in substance, if not always in form, preach the opposite doctrine. They are constantly striving to free the moral ideal from the stifling embrace of the current theology and its concomitant ritual. Theirs was not an intellectual criticism, argued on strictly scientific grounds; the image-worshippers and the believers in the efficacy

of sacrifices and ceremonies might logically have held their own against anything the prophets have to say; it was an ethical criticism. From the height of his moral intuition—that the whole duty of man is to do justice and to love mercy and to bear himself as humbly as befits his insignificance in face of the Infinite—the prophet simply laughs at the idolaters of stocks and stones and the idolaters of ritual. Idols of the first kind, in his experience, were inseparably united with the practice of immorality, and they were to be ruthlessly destroyed. As for sacrifices and ceremonies, whatever their intrinsic value might be, they might be tolerated on condition of ceasing to be idols; they might even be praiseworthy on condition of being made to subserve the worship of the true Jahveh—the moral ideal.

If the realm of David had remained undivided, if the Assyrian and the Chaldean and the Egyptian had left Israel to the ordinary course of development of an Oriental kingdom, it is possible that the effects of the reforming zeal of the prophets of the eighth and seventh centuries might have been effaced by the growth, according to its inevitable tendencies, of the theology which they combated. But the captivity made the fortune of the ideas which it was the privilege of these men to launch upon an endless career. With the abolition of the Temple-services for more than half a century, the priest must have lost and the scribe

gained influence. The puritanism of a vigorous minority among the Babylonian Jews rooted out polytheism from all its hiding-places in the theology which they had inherited; they created the first consistent, remorseless, naked monotheism, which, so far as history records, appeared in the world (for Zoroastrism is practically ditheism, and Buddhism any-theism or no-theism); and they inseparably united therewith an ethical code, which, for its purity and for its efficiency as a bond of social life, was and is, unsurpassed. So I think we must not judge Ezra and Nehemiah and their followers too hardly, if they exemplified the usual doom of poor humanity to escape from one error only to fall into another; if they failed to free themselves as completely from the idolatry of ritual as they had from that of images and dogmas; if they cherished the new fetters of the Levitical legislation which they had fitted upon themselves and their nation, as though such bonds had the sanctity of the obligations of morality; and if they led succeeding generations to spend their best energies in building that "hedge round the Torah" which was meant to preserve both ethics and theology, but which too often had the effect of pampering the latter and starving the former. The world being what it was, it is to be doubted whether Israel would have preserved intact the pure ore of religion, which the prophets had extracted for the use of mankind as well as for

their nation, had not the leaders of the nation been zealous, even to death, for the dross of the law in which it was embedded. The struggle of the Jews, under the Maccabean house, against the Seleucidæ was as important for mankind as that of the Greeks against the Persians. And, of all the strange ironies of history, perhaps the strangest is that "Pharisee" is current, as a term of reproach, among the theological descendants of that sect of Nazarenes who, without the martyr spirit of those primitive Puritans, would never have come into existence. They, like their historical successors, our own Puritans, have shared the general fate of the poor wise men who save cities.

A criticism of theology from the side of science is not thought of by the prophets, and is at most indicated in the books of Job and Ecclesiastes, in both of which the problem of vindicating the ways of God to man is given up, though on different grounds, as a hopeless one. But with the extensive introduction of Greek thought among the Jews, which took place, not only during the domination of the Seleucidæ in Palestine, but in the great Judaic colony which flourished in Egypt under the Ptolemies, criticism, on both ethical and scientific grounds, took a new departure.

In the hands of the Alexandrian Jews, as represented by Philo, the fundamental axiom of later Jewish, as of Christian monotheism, that the Deity

is infinitely perfect and infinitely good, worked itself out into its logical consequence—agnostic theism. Philo will allow of no point of contact between God and a world in which evil exists. For him God has no relation to space or to time, and, as infinite, suffers no predicate beyond that of existence. It is therefore absurd to ascribe to Him mental faculties and affections comparable in the remotest degree to those of men; He is in no way an object of cognition; He is ἄποιος and ἀκατάληκτος[1]—without quality and incomprehensible. That is to say the Alexandrian Jew of the first century had anticipated the reasonings of Hamilton and Mansell in the nineteenth, and, for him, God is the Unknowable in the sense in which that term is used by Mr. Herbert Spencer. Moreover, Philo's definition of the Supreme Being would not be inconsistent with that "substantia constans infinitis attributis, quorum unumquodque æternam et infinitam essentiam exprimit," given by another great Israelite, were it not that Spinoza's doctrine of the immanence of the Deity in the world puts him, at any rate formally, at the antipodes of theological speculation. But the conception of the essential incognoscibility of the Deity is the same in each case. However, Philo

[1] See the careful analsyis of the work of the Alexandrian philosopher and theologian (who, it should be remembered, was a most devout Jew, held in the highest esteem by his countrymen) in Siegfried's *Philo von Alexandrien*, 1875. [Also Dr. J. Drummond's *Philo Judæus*, 1888.]

was too thorough an Israelite and too much the child of his time to be content with this agnostic position. With the help of the Platonic and Stoic philosophy, he constructed an apprehensible, if not comprehensible, quasi-deity out of the Logos; while other more or less personified divine powers, or attributes, bridged over the interval between God and man; between the sacred existence, too pure to be called by any name which implied a conceivable quality, and the gross and evil world of matter. In order to get over the ethical difficulties presented by the naïve naturalism of many parts of those Scriptures, in the divine authority of which he firmly believed, Philo borrowed from the Stoics (who had been in like straits in respect of Greek mythology), that great Excalibur which they had forged with infinite pains and skill—the method of allegorical interpretation. This mighty "two-handed engine at the door" of the theologian is warranted to make a speedy end of any and every moral or intellectual difficulty, by showing that, taken allegorically or, as it is otherwise said, "poetically" or, "in a spiritual sense," the plainest words mean whatever a pious interpreter desires they should mean. In Biblical phrase, Zeno (who probably had a strain of Semitic blood in him) was the "father of all such as reconcile." No doubt Philo and his followers were eminently religious men; but they did endless injury to the cause of religion

by laying the foundations of a new theology, while equipping the defenders of it with the subtlest of all weapons of offence and defence, and with an inexhaustible store of sophistical arguments of the most plausible aspect.

The question of the real bearing upon theology of the influence exerted by the teaching of Philo's contemporary, Jesus of Nazareth, is one upon which it is not germane to my present purpose to enter. I take it simply as an unquestionable fact that his immediate disciples, known to their countrymen as "Nazarenes," were regarded as, and considered themselves to be, perfectly orthodox Jews, belonging to the puritanic or pharisaic section of their people, and differing from the rest only in their belief that the Messiah had already come. Christianity, it is said, first became clearly differentiated at Antioch, and it separated itself from orthodox Judaism by denying the obligation of the rite of circumcision and of the food prohibitions, prescribed by the law. Henceforward theology became relatively stationary among the Jews,[1] and the history of its rapid progress in a new course of evolution is the history of the

[1] I am not unaware of the existence of many and widely divergent sects and schools among the Jews at all periods of their history, since the dispersion. But I imagine that orthodox Judaism is now pretty much what it was in Philo's time; while Peter and Paul, if they could return to life, would certainly have to learn the catechism of either the Roman, Greek, or Anglican Churches, if they desired to be considered orthodox Christians

Christian Churches, orthodox and heterodox. The steps in this evolution are obvious. The first is the birth of a new theological scheme arising out of the union of elements derived from Greek philosophy with elements derived from Israelitic theology. In the fourth Gospel, the Logos, raised to a somewhat higher degree of personification than in the Alexandrian theosophy, is identified with Jesus of Nazareth. In the Epistles, especially the later of those attributed to Paul, the Israelitic ideas of the Messiah and of sacrificial atonement coalesce with one another and with the embodiment of the Logos in Jesus, until the apotheosis of the Son of man is almost, or quite, effected. The history of Christian dogma, from Justin to Athanasius, is a record of continual progress in the same direction, until the fair body of religion, revealed in almost naked purity by the prophets, is once more hidden under a new accumulation of dogmas and of ritual practices of which the primitive Nazarene knew nothing; and which he would probably have regarded as blasphemous if he could have been made to understand them.

As, century after century, the ages roll on, polytheism comes back under the disguise of Mariolatry and the adoration of saints; image-worship becomes as rampant as in old Egypt; adoration of relics takes the place of the old fetish-worship; the virtues of the ephod pale before those of holy coats and handkerchiefs; shrines and calvaries

make up for the loss of the ark and of the high places; and even the lustral fluid of paganism is replaced by holy water at the porches of the temples. A touching ceremony—the common meal originally eaten in pious memory of a loved teacher—becomes metamorphosed into a flesh-and-blood sacrifice, supposed to possess exactly that redeeming virtue which the prophets denied to the flesh-and-blood sacrifices of their day; while the minute observance of ritual is raised to a degree of punctilious refinement which Levitical legislators might envy. And with the growth of this theology, grew its inevitable concomitant, the belief in evil spirits, in possession, in sorcery, in charms and omens, until the Christians of the twelfth century after our era were sunk in more debased and brutal superstitions than are recorded of the Israelites in the twelfth century before it.

The greatest men of the Middle Ages are unable to escape the infection. Dante's "Inferno" would be revolting if it were not so often sublime, so often exquisitely tender. The hideous pictures which cover a vast space on the south wall of the Campo Santo of Pisa convey information, as terrible as it is indisputable, of the theological conceptions of Dante's countrymen in the fourteenth century, whose eyes were addressed by the painters of those disgusting scenes, and whose approbation they knew how to win. A candid Mexican of the time of Cortez, could he have seen this

Christian burial-place, would have taken it for an appropriately adorned Teocalli. The professed disciple of the God of justice and of mercy might there gloat over the sufferings of his fellowmen depicted as undergoing every extremity of atrocious and sanguinary torture to all eternity, for theological errors no less than for moral delinquencies; while, in the central figure of Satan,[1] occupied in champing up souls in his capacious and well-toothed jaws, to void them again for the purpose of undergoing fresh suffering, we have the counterpart of the strange Polynesian and Egyptian dogma that there were certain gods who employed themselves in devouring the ghostly flesh of the spirits of the dead. But in justice to the Polynesians, it must be recollected that, after three such operations, they thought the soul was purified and happy. In the view of the Christian theologian the operation was only a preparation for new tortures continued for ever and aye.

With the growth of civilisation in Europe, and with the revival of letters and of science in the

[1] Dante's description of Lucifer engaged in the eternal mastication of Brutus, Cassius, and Judas Iscariot—

"Da ogni bocca dirompea co' denti
Un peccatore, a guisa di maciulla,
Si che tre ne facea così dolenti.
A quel dinanzi il mordere era nulla,
Verso 'l graffiar, chè tal volta la schiena
Rimanea della pelle tutta brulla"—

is quite in harmony with the Pisan picture and perfectly Polynesian in conception.

fourteenth and fifteenth centuries, the ethical and intellectual criticism of theology once more recommenced, and arrived at a temporary resting-place in the confessions of the various reformed Protestant sects in the sixteenth century; almost all of which, as soon as they were strong enough, began to persecute those who carried criticism beyond their own limit. But the movement was not arrested by these ecclesiastical barriers, as their constructors fondly imagined it would be; it was continued, tacitly or openly, by Galileo, by Hobbes, by Descartes, and especially by Spinoza, in the seventeenth century; by the English Freethinkers, by Rousseau, by the French Encyclopædists, and by the German Rationalists, among whom Lessing stands out a head and shoulders taller than the rest, throughout the eighteenth century; by the historians, the philologers, the Biblical critics, the geologists, and the biologists in the nineteenth century, until it is obvious to all who can see that the moral sense and the really scientific method of seeking for truth are once more predominating over false science. Once more ethics and theology are parting company.

It is my conviction that, with the spread of true scientific culture, whatever may be the medium, historical, philological, philosophical, or physical, through which that culture is conveyed, and with its necessary concomitant, a constant elevation of the standard of veracity, the end of the evolution

of theology will be like its beginning—it will cease to have any relation to ethics. I suppose that, so long as the human mind exists, it will not escape its deep-seated instinct to personify its intellectual conceptions. The science of the present day is as full of this particular form of intellectual shadow-worship as is the nescience of ignorant ages. The difference is that the philosopher who is worthy of the name knows that his personified hypotheses, such as law, and force, and ether, and the like, are merely useful symbols, while the ignorant and the careless take them for adequate expressions of reality. So, it may be, that the majority of mankind may find the practice of morality made easier by the use of theological symbols. And unless these are converted from symbols into idols, I do not see that science has anything to say to the practice, except to give an occasional warning of its dangers. But, when such symbols are dealt with as real existences, I think the highest duty which is laid upon men of science is to show that these dogmatic idols have no greater value than the fabrications of men's hands, the stocks and the stones, which they have replaced.

END OF VOL. IV.

Recent Volumes of the International Scientific Series.

A HISTORY OF CRUSTACEA. By Rev. THOMAS R. R. STEBBING, M. A., author of "The Challenger Amphipoda, etc. With numerous Illustrations. 12mo. Cloth, $2.00.

"Mr. Stebbing's account of 'Recent Malacostraca' (soft-shelled animals) is practically complete, and is based upon the solid foundations of science. The astonishing development of knowledge in this branch of natural history is due to the extension of marine research, the perfecting of the microscope, and the general diffusion of information regarding what has been ascertained concerning the origin of species. . . . This volume is fully illustrated, and contains useful references to important authorities. It is an able and meritorious survey of recent crustacea."—*Philadelphia Ledger.*

"In all respects an admirable piece of work."—*The Churchman.*

"One of the most valuable and entertaining volumes in the series. . . . The author is master of an engaging style, and offers words of cheer and counsel to the beginner who may be dismayed by the bewildering riches of the crustacean world. Every branch of the subject treated is presented in the most interesting and significant light."—*London Saturday Review.*

HANDBOOK OF GREEK AND LATIN PALÆOGRAPHY. By EDWARD MAUNDE THOMPSON, D. C. L., Principal Librarian of the British Museum. With numerous Illustrations. 12mo. Cloth, $2.00.

"Mr. Thompson, as principal librarian of the British Museum, has of course had very exceptional advantages for preparing his book. . . . Probably all teachers of the classics, as well as specialists in palæography, will find something of value in this systematic treatise upon a rather unusual and difficult study."—*Review of Reviews.*

"A well-arranged manual from the hands of a competent authority. . . . Of the nineteen chapters contained in the volume, seven deal with preliminary topics, as the history of the Greek and the Latin alphabets, writing materials, the forms of books, punctuation, measurement of lines, shorthand, abbreviations, and contractions; five are devoted to Greek palæography, seven to Latin."—*The Critic.*

"Covering as this volume does such a vast period of time, from the beginning of the alphabet and the ways of writing down to the seventeenth century, the wonder is how, within three hundred and thirty-three pages, so much that is of practical usefulness has been brought together."—*New York Times.*

MAN AND THE GLACIAL PERIOD. By G. FREDERICK WRIGHT, D. D., LL. D., author of "The Ice Age in North America," "Logic of Christian Evidences," etc. With numerous Illustrations. 12mo. Cloth, $1.75.

"The author is himself an independent student and thinker whose competence and authority are undisputed."—*New York Sun.*

"It may be described in a word as the best summary of scientific conclusions concerning the question of man's antiquity as affected by his known relations to geological time."—*Philadelphia Press.*

"The earlier chapters describing glacial action, and the traces of it in North America—especially the defining of its limits, such as the terminal moraine of the great movement itself—are of great interest and value. The maps and diagrams are of much assistance in enabling the reader to grasp the vast extent of the movement."—*London Spectator.*

EVOLUTION SERIES, NOS. 1 TO 17.

Popular Lectures and Discussions before the Brooklyn Ethical Association.

EVOLUTION IN SCIENCE, PHILOSOPHY, AND ART. With 3 Portraits. Large 12mo. Cloth, $2.00.

CONTENTS.

Alfred Russel Wallace. By EDWARD D. COPE, Ph. D.
Ernst Haeckel. By THADDEUS B. WAKEMAN.
The Scientific Method. By FRANCIS E. ABBOTT, Ph. D.
Herbert Spencer's Synthetic Philosophy. By BENJAMIN F. UNDERWOOD.
Evolution of Chemistry. By ROBERT G. ECCLES, M. D.
Evolution of Electric and Magnetic Physics. By ARTHUR E. KENNELLY.
Evolution of Botany. By FRED J. WULLING, Ph. G.
Zoölogy as related to Evolution. By Rev. JOHN C. KIMBALL.
Form and Color in Nature. By WILLIAM POTTS.
Optics as related to Evolution. By L. A. W. ALLEMAN, M. D.
Evolution of Art. By JOHN A. TAYLOR.
Evolution of Architecture. By Rev. JOHN W. CHADWICK.
Evolution of Sculpture. By Prof. THOMAS DAVIDSON.
Evolution of Painting. By FORREST P. RUNDELL.
Evolution of Music. By Z. SIDNEY SAMPSON.
Life as a Fine Art. By LEWIS G. JANES, M. D.
The Doctrine of Evolution: its Scope and Influence. By Prof. JOHN FISKE.

"The addresses include some of the most important presentations and epitomes published in America. They are all upon important subjects, are prepared with great care, and are delivered for the most part by highly eminent authorities."—*Public Opinion.*

EVOLUTION SERIES, NOS. 18 TO 34.

MAN AND THE STATE. Studies in Applied Sociology. With Index. Large 12mo. Cloth, $2.00.

CONTENTS.

The Duty of a Public Spirit. By E. BENJAMIN ANDREWS, D. D., LL. D.
The Study of Applied Sociology. By ROBERT G. ECCLES, M. D.
Representative Government. By EDWIN D. MEAD.
Suffrage and the Ballot. By DANIEL S. REMSEN.
The Land Problem. By Prof. OTIS T. MASON.
The Problem of City Government. By Dr. LEWIS G. JANES.
Taxation and Revenue: The Free-Trade View. By THOMAS G. SHEARMAN.
Taxation and Revenue: The Protectionist View. By Prof. GEORGE GUNTON.
The Monetary Problem. By WILLIAM POTTS.
The Immigration Problem. By Z. SIDNEY SAMPSON.
Evolution of the Afric-American. By Rev. SAMUEL J. BARROWS.
The Race Problem in the South. By Prof. JOSEPH LE CONTE.
Education and Citizenship. By Rev. JOHN W. CHADWICK.
The Democratic Party. By EDWARD M. SHEPARD.
The Republican Party. By Hon. ROSWELL G. HORR.
The Independent in Politics. By JOHN A. TAYLOR.
Moral Questions in Politics. By Rev. JOHN C. KIMBALL.

"These studies in applied sociology are exceptionally interesting in their field."—*Cincinnati Times-Star.*

"Will command the attention of the progressive student of politics."—*Pittsburg Chronicle-Telegraph.*

Separate Lectures from either volume, 10 cents each.

New York: D. APPLETON & CO., 1, 3, & 5 Bond Street.

EVOLUTION SERIES, NOS. 35 TO 48.

FACTORS IN AMERICAN CIVILIZATION: STUDIES IN APPLIED SOCIOLOGY. Popular Lectures and Discussions before the BROOKLYN ETHICAL ASSOCIATION. 12mo. Cloth, $2.00. Separate Lectures, in Pamphlet Form, 10 cents each.

This volume is uniform with the two previous volumes of the series, entitled respectively "Evolution in Science and Art" and "Man and the State."

CONTENTS.

35. *The Nation: Place in Civilization.* By CHARLES DE GARMO, Ph. D., President of Swarthmore College.
36. *Natural Factors in American Civilization.* By Rev. JOHN C. KIMBALL.
37. *What America Owes to the Old World.* By A. EMERSON PALMER.
38. *War and Progress.* By Dr. LEWIS G. JANES.
39. *Interstate Commerce.* By ROBERT W. TAYLER.
40. *Foreign Commerce.* By Hon. WILLIAM J. COOMBS.
41. *The Social and Political Status of Woman.* By Rev. JOHN W. CHADWICK.
42. *The Economic Position of Woman.* By Miss CAROLINE B. LE ROW.
43. *Evolution of Penal Methods and Institutions.* By JAMES MCKEEN.
44. *Evolution of Charities and Charitable Institutions.* By Prof. AMOS G. WARNER, Ph. D., Superintendent of Public Charities, Washington, D. C.
45. *The Drink Problem.* By T. D. CROTHERS, M. D., Editor of the "Quarterly Journal of Inebriety."
46. *The Labor Problem.* By Rev. NICHOLAS P. GILMAN, Editor of the "New World."
47. *Political Aspect of the Labor Problem.* By JEREMIAH W. SULLIVAN.
48. *The Philosophy of History.* By Rev. E. P. POWELL, Author of "Our Heredity from God," etc.

"One can hardly speak too highly of the work which is being done by the Brooklyn Ethical Association. Its plan is to bring within definite compass and knowledge some of the largest subjects which can occupy the minds of thoughtful men. It has for its members and speakers men who are equal to this task, and here we have some of the best work on subjects of the highest meaning that has been done by Americans."—*Boston Herald.*

A new volume in Herbert Spencer's System of Synthetic Philosophy.

THE PRINCIPLES OF ETHICS. Vol. II. By HERBERT SPENCER. 12mo. Cloth, $2.00.

This volume consists of three parts, the first of which, "Justice," has been previously published separately. The parts which the author has now completed are entitled respectively "Negative Beneficence" and "Positive Beneficence." (For convenience of those who already possess the first part, the other two are bound together in a separate volume; price, $1.25.)

In the complete "Principles of Ethics" the reader possesses one of the most able and at the same time lucid interpretations of modern philosophical thought. In familiar language and entertaining style, with no tendency toward abstruseness, the author deals with his subject in nearly one hundred brief chapters, discussing such topics as "Good and Bad Conduct," "Ways of Judging Conduct," "Conciliation," "The Confusion of Ethical Thought," "Revenge," "Justice," "Generosity," "Veracity," "Chastity," "Culture," "Amusements," "Marriage," "Parenthood," "Animal Ethics," "Human Justice," "The Right of Property," "The Rights of Women," "The Rights of Children," "The Nature of the State," "The Duties of the State," "Pecuniary Aid to Relatives and Friends," "Relief of the Poor," "Political Beneficence," etc.

A detailed list of chapter titles of all the volumes of the Synthetic Philosophy Series will be sent to any address on request.

"The volume [II] is of the highest importance, and we heartily congratulate the veteran philosopher upon the completion of a fabric which must ever remain a landmark in the history of human thought."—*London Times.*

"As into the details of astronomical investigation was carried the master conception of gravitation, so has Mr. Spencer carried into history, philosophy, and morals the illuminating and unifying idea of evolution. Whatever be the standpoint from which this system is viewed, it must be recognized that it has already produced a profound modification of ideas on the subject with which it deals."—*London Literary World.*

"The past decade has been an era of crude and rash speculation upon social and political problems. In America, no less than in England, we have need to listen to the voice of one who looks neither to the invention of a closet philosophy nor to the chance suggestion of the political empiricist, but to the eternal laws of Nature for wise counsel and enlightenment upon these vast issues. It is refreshing to turn to the wise and conservative counsels of Mr. Spencer."—*Popular Science Monthly.*

"Mr. Spencer's style is so lucid that to study political economy of him is rather a pleasure than a task."—*Chicago Tribune.*

Volumes I and II of "The Principles of Ethics," 12mo, cloth, $4.00.

New York: D. APPLETON & CO., 1, 3, & 5 Bond Street.

NEW EDITION OF SPENCER'S ESSAYS.

ESSAYS: Scientific, Political, and Speculative. By HERBERT SPENCER. A new edition, uniform with Mr. Spencer's other works, including Seven New Essays. Three volumes, 12mo, 1,460 pages, with full Subject-Index of twenty-four pages. Cloth, $6.00.

CONTENTS OF VOLUME I.

The Development Hypothesis.
Progress: its Law and Cause.
Transcendental Physiology.
The Nebular Hypothesis.
Illogical Geology.
Bain on the Emotions and the Will.
The Social Organism.
The Origin of Animal Worship.
Morals and Moral Sentiments.
The Comparative Psychology of Man.
Mr. Martineau on Evolution.
The Factors of Organic Evolution.*

CONTENTS OF VOLUME II.

The Genesis of Science
The Classification of the Sciences.
Reasons for dissenting from the Philosophy of M. Comte.
On Laws in General, and the Order of their Discovery.
The Valuation of Evidence.
What is Electricity?
Mill *versus* Hamilton—The Test of Truth.
Replies to Criticisms.
Prof. Green's Explanations.
The Philosophy of Style.†
Use and Beauty.
The Sources of Architectural Types.
Gracefulness.
Personal Beauty.
The Origin and Function of Music.
The Physiology of Laughter.

CONTENTS OF VOLUME III.

Manners and Fashion.
Railway Morals and Railway Policy.
The Morals of Trade.
Prison-Ethics.
The Ethics of Kant.
Absolute Political Ethics.
Over-Legislation.
Representative Government—What is it good for?
State-Tampering with Money and Banks
Parliamentary Reform: the Dangers and the Safeguards.
"The Collective Wisdom."
Political Fetichism.
Specialized Administration.
From Freedom to Bondage.
The Americans.‡
Index.

* Also published separately. 12mo. Cloth, 75 cents.
† Also published separately. 12mo. Cloth, 50 cents.
‡ Also published separately. 12mo. Paper, 10 cents; cloth, 50 cents.

EVOLUTION OF MAN AND CHRISTIANITY. New edition. By the Rev. HOWARD MACQUEARY. With a new Preface, in which the Author answers his Critics, and with some important Additions. 12mo. Cloth, $1.75.

"This is a revised and enlarged edition of a book published last year. The author reviews criticisms upon the first edition, denies that he rejects the doctrine of the incarnation, admits his doubts of the physical resurrection of Christ, and his belief in evolution. The volume is to be marked as one of the most profound expressions of the modern movement toward broader theological positions."—*Brooklyn Times.*

"He does not write with the animus of the destructive school; he intends to be, and honestly believes he is, doing a work of construction, or at least of reconstruction. . . . He writes with manifest earnestness and conviction, and in a style which is always clear and energetic."—*Churchman.*

HISTORY OF THE CONFLICT BETWEEN RELIGION AND SCIENCE. By Dr. JOHN WILLIAM DRAPER. 12mo. Cloth, $1.75.

"The key-note to this volume is found in the antagonism between the progressive tendencies of the human mind and the pretensions of ecclesiastical authority, as developed in the history of modern science. No previous writer has treated the subject from this point of view, and the present monograph will be found to possess no less originality of conception than vigor of reasoning and wealth of erudition."—*New York Tribune.*

A CRITICAL HISTORY OF FREE THOUGHT IN REFERENCE TO THE CHRISTIAN RELIGION. By Rev. Canon ADAM STOREY FARRAR, D. D., F. R. S., etc. 12mo. Cloth, $2.00.

"A conflict might naturally be anticipated between the reasoning faculties of man and a religion which claims the right, on superhuman authority, to impose limits on the field or manner of their exercise. It is the chief of the movements of free thought which it is my purpose to describe, in their historic succession, and their connection with intellectual causes. We must ascertain the facts, discover the causes, and read the moral."—*The Author.*

CREATION OR EVOLUTION? A Philosophical Inquiry. By GEORGE TICKNOR CURTIS. 12mo. Cloth, $2.00.

"A treatise on the great question of Creation or Evolution by one who is neither a naturalist nor theologian, and who does not profess to bring to the discussion a special equipment in either of the sciences which the controversy arrays against each other, may seem strange at first sight; but Mr. Curtis will satisfy the reader, before many pages have been turned, that he has a substantial contribution to make to the debate, and that his book is one to be treated with respect. His part is to apply to the reasonings of the men of science the rigid scrutiny with which the lawyer is accustomed to test the value and pertinency of testimony, and the legitimacy of inferences from established facts."—*New York Tribune.*

"Mr. Curtis's book is honorably distinguished from a sadly too great proportion of treatises which profess to discuss the relation of scientific theories to religion, by its author's thorough acquaintance with his subject, his scrupulous fairness, and remarkable freedom from passion."—*London Literary World.*

OUR HEREDITY FROM GOD. Consisting of Lectures on Evolution. By E. P. POWELL. Fourth edition. 12mo. Cloth, $1.75.

"It is written in a simple, homely, fresh, and piquant style, that will engage the interest of every intelligent reader. Even those who have prejudged the matter in debate, if they once begin to read, will find it hard to stop; and when they reach the end, if they do not make an unconditional surrender, they will find that some of their heavy guns are missing, a good deal of their light artillery, and a great deal of their useless baggage of contempt and scorn for doctrines which they did not understand."—*Christian Register.*

"Mr. Powell traces the rise of intelligence and morals out of and above all preceding developments, until he reaches the great questions of God and immortality. As a statement of the process of conviction by which the doctrine of evolution is established for the development of physical life the work is entitled to confidence, and will interest and instruct its readers."—*Boston Herald.*

"An earnest and profound thinker, Mr. Powell is a logical, forcible, and brilliant writer as well. It is safe to say that no one of the very numerous works which of late years have sought to demonstrate the unknowable, unprovable mysteries of which Darwin and Spencer are the chief apostles and enunciators, has done so in more lucid, scholarly fashion."—*New Orleans Times-Democrat.*

"All parts of the book are instructive, and while they instruct they never fail to interest. The driest facts of the evolution problem are made plain, and happily illustrated; but it is in such chapters as close the work that the interest culminates and the purpose of the work is seen. No one will regret owning and reading Mr. Powell's work."—*Boston New Ideal.*

STUDIES IN HEGEL'S PHILOSOPHY OF RELIGION. With an Appendix on Christian Unity in America. By J. MACBRIDE STERRETT, D. D., Professor of Ethics and Apologetics in the Seabury Divinity School; author of "Reason and Authority in Religion." Second edition. 12mo. Cloth, $2.00.

"Professor Sterrett's 'Studies' are well written and careful. . . . If one wishes to know about Hegel on the Philosophy of Religion, there is really no better book than the present. . . . It gives an excellent general view of the Hegelian position."—*London Saturday Review.*

"A book for study and prolonged consideration. No one can read it without receiving much intellectual and spiritual stimulus."—*Bibliotheca Sacra.*

"The American book I hold worthy of a place beside *Lux Mundi.* It gives the logical method which *Lux Mundi* applies in a less technical and more popular treatment. They are *studies* at first hand, . . . earnest and noble, and offer noble aid to thought that would climb the loftiest and most difficult steep of knowledge. The path they trace is clear to the peak."—Rev. R. A. HOLLAND, D. D., in *The Living Church.*

"Dr. Sterrett is far more than a slavish expositor. . . . We cordially commend it as giving to the general reader a valuable idea of the great German's method in philosophy, as well as initiating him into the latter's treatment of some of the most important departments of human thinking."—*London Literary World.*

"Dr. Sterrett has given to the elucidation of Hegel those literary and critical abilities which make his book a valuable contribution to theology. No one can read it without profit. Dr. Sterrett is a helpful guide. He is careful, honest, frank, and scholarly."—*The Standard of the Cross and the Church.*

INTRODUCTION TO THE STUDY OF PHILOSOPHY. By WILLIAM T. HARRIS, LL. D., United States Commissioner of Education. Compiled and arranged by MARIETTA KIES. 12mo. Cloth, $1.50.

"Philosophy as presented by Dr. Harris gives to the student an interpretation and explanation of the phases of existence which render even the ordinary affairs of life in accordance with reason; and for the higher or spiritual phases of life his interpretations have the power of a great illumination. Many of the students are apparently awakened to an interest in philosophy, not only as a subject to be taken as a prescribed study, but also as a subject of fruitful interest for future years and as a key which unlocks many of the mysteries of other subjects pursued in a college course."—*From the Compiler's Preface.*

A HISTORY OF PHILOSOPHY IN EPITOME. By ALBERT SCHWEGLER. Translated from the first edition of the original German by JULIUS H. SEELYE. Revised from the ninth German edition, containing Important Additions and Modifications, with an Appendix, continuing the History in its more Prominent Lines of Development since the Time of Hegel, by BENJAMIN T. SMITH. 12mo. Cloth, $2.00.

"Schwegler's History of Philosophy is found in the hands of almost every student in the philosophical department of a German University, and is highly esteemed for its clearness, conciseness, and comprehensiveness. The present translation was undertaken with the conviction that the work would not lose its interest or its value in an English dress, and with the hope that it might be of wider service in such a form to students of philosophy here. It was thought especially that a proper translation of this manual would supply a want for a suitable text-book on this branch of study, long felt by both teachers and students in our American colleges."—*From the Preface.*

BIOGRAPHICAL HISTORY OF PHILOSOPHY, from its Origin in Greece down to the Present Day. By GEORGE HENRY LEWES. Two volumes in one. 8vo. Cloth, $3.50. Also in 2 vols., small 8vo. Cloth, $4.00.

"Philosophy was the great initiator of science. It rescued the nobler part of man from the dominion of brutish apathy and helpless ignorance, nourished his mind with mighty impulses, exercised it in magnificent efforts, gave him the unslaked, unslakable thirst for knowledge which has dignified his life, and enabled him to multiply tenfold his existence and his happiness. Having done this, its part is played. Our interest in it now is purely historical. The purport of this history is to show how and why the interest in philosophy has become purely historical."—*From the Introduction.*

THE SCIENCE OF LAW. By Professor SHELDON AMOS, M. A. 12mo. Cloth, $1.75.

CONTENTS.—Chapter I. Recent History and Present Condition of the Science of Law; II Province and Limits of the Science of Law; III. Law and Morality; IV. The Growth of Law; V. The Growth of Law (continued); VI. Elementary Conceptions and Terms; VII. Law in Relation to (1) the State, (2) the Family, (3) the other Constituent Elements of the Race; VIII. Laws of Ownership of Property; IX. Law of Contract; X. Criminal Law and Procedure; XI. The Law of Civil Procedure; XII. International Law; XIII. Codification; XIV. Law and Government.

"Professor Amos has certainly done much to clear the science of law from the technical obscurities which darken it to minds which have had no legal training, and to make clear to his 'lay' readers in how true and high a sense it can assert its right to be considered a science, and not a mere practice."—*Christian Register.*

THE SCIENCE OF POLITICS. By Professor SHELDON AMOS, M. A., author of "The Science of Law," etc. 12mo. Cloth, $1.75.

CONTENTS.—Chapter I. Nature and Limits of the Science of Politics; II. Political Terms; III. Political Reasoning; IV. The Geographical Area of Modern Politics; V. The Primary Elements of Political Life and Action; VI Constitutions; VII. Local Government; VIII. The Government of Dependencies; IX. Foreign Relations; X. The Province of Government; XI. Revolutions in States; XII. Right and Wrong in Politics.

"The author traces the subject from Plato and Aristotle in Greece, and Cicero in Rome, to the modern schools in the English field, not slighting the teachings of the American Revolution or the lessons of the French Revolution of 1793. Forms of government, political terms, the relation of law, written and unwritten, to the subject, a codification from Justinian to Napoleon in France and Field in America, are treated as parts of the subject in hand. Necessarily the subjects of executive and legislative authority, police, liquor, and land laws are considered, and the question ever growing in importance in all countries, the relations of corporations to the state."—*N. Y. Observer.*

DIGEST OF THE LAWS, CUSTOMS, MANNERS, AND INSTITUTIONS OF ANCIENT AND MODERN NATIONS. By THOMAS DEW, late President of the College of William and Mary. 8vo. Cloth, $2.00.

No pains have been spared by the author to secure accuracy in facts and figures; and in doubtful cases references are given in parentheses, so that the student can readily satisfy himself by going to original sources. The department of Modern History, too often neglected in works of this kind, has received special care and attention.

ROMAN LAW; Its History and System of Private Law. In Twelve Academical Lectures. By Professor JAMES HADLEY. 12mo. Cloth, $1.25.

"The most valuable short account of the nature and importance of the body of Roman law. The lectures are free from embarrassing technical details, while at the same time they are sufficiently elaborate to give a definite idea of the nature and the greatness of the subject."—*Dr. C. K. Adams's Manual of Historical Literature.*

New York: D. APPLETON & CO., 1, 3, & 5 Bond Street.

MEMOIRS. By CHARLES GODFREY LELAND (Hans Breitmann) With Portrait. 12mo. Cloth, $2.00.

"From first to last a very entertaining book, full of good stories, strange adventures, curious experiences, and not inconsiderable achievements, instinct with the strong personality of the writer."—*London Times.*

"A book that no one who wants to be entertained as he has not been entertained in many a long day can afford to let go unread."—*New York Herald.*

"Mr. Charles G. Leland's 'Memoirs' may be reckoned among the autobiographical successes of the day. . . Mr. Leland's experiences were out of the common run, and his book is a fair reflection of the exceptional character of his life. . . . This volume will add to his fame, not lessen it."—G. W. S., *in New York Tribune.*

"In a way Mr. Leland's 'Memoirs' carry with them the same joy as Sir Richard Burton's, in that they combine the charms of the man of intellect and the man of action. Happily they differ in that Mr Leland is still alive. Mr. Leland's stories about the American war are interesting. If anything were needed to enlarge one's ideas of that tremendous struggle, Mr. Leland's stories would do it."—*Pall Mall Gazette.*

THE STORY OF MY LIFE. By GEORG EBERS, author of "Uarda," "An Egyptian Princess," "A Thorny Path," etc. With Portraits. 16mo. Cloth, $1.25.

"It is written with a charming frankness that is peculiarly German, and an appreciation of the incidents of his life that is peculiar to the novelist. Few of his stories afford more agreeable reading."—*The Critic.*

"To those who know Dr. Ebers chiefly as an Egyptologist, and whose interest lies in his imaginative work, the early chapters of this autobiography will prove a source of illumination, for it is in them that we are let into the secrets of those experiences which not only molded his character but were potent in shaping the bent of his mind."—*Philadelphia Bulletin.*

"One of the most delightful books which Georg Ebers, the German Egyptologist and novelist, has written, and this is saying a great deal. . . . It is the picture of the life of a bright, active, happy boy in a German home of the most worthy sort, and at German schools mostly of conspicuous excellence. There is neither undue frankness nor superfluous reticence, but the things which one wishes to be told are recorded naturally and entertainingly."—*The Congregationalist.*

PERSONAL RECOLLECTIONS OF WERNER VON SIEMENS. Translated by W. C. COUPLAND. With Portrait. 8vo. Cloth, $5.00.

"This volume of straightforward reminiscence reflects new credit on its author, and deserves a high place among the records of great inventors who have made a name and a fortune in ways which have been of immense public benefit."—*Literary World.*

"The full account of Siemens's work will be most interesting to the engineer and to the man of science; but even the reader who may choose to skip all this will find it one of the most charming publications of the year."—*The Nation.*

"The general reader need not be deterred from taking up the book by the fear that he will have to wade through chapters of long technical terms which he does not understand. Whether he is describing his simple home life or his scientific career and its manifold achievements, Von Siemens writes plainly, unaffectedly, and in a uniformly attractive fashion. The whole work is, as the publishers of the translation say with truth, 'rich in genial narrative, stirring adventure, and picturesque description,' and stamped throughout with the impress of an original mind and a sterling character."—*London Times.*

THE HISTORICAL REFERENCE-BOOK, comprising a Chronological Table of Universal History, a Chronological Dictionary of Universal History, a Biographical Dictionary. With Geographical Notes. For the use of Students, Teachers, and Readers. By LOUIS HEILPRIN. Fourth edition, revised and brought down to 1893. Crown 8vo. 569 pages. Half leather, $3.00.

"One of the most complete, compact, and valuable works of reference yet produced."—*Troy Daily Times.*

"Unequaled in its field."—*Boston Courier.*

"A small library in itself."—*Chicago Dial.*

"An invaluable book of reference, useful alike to the student and the general reader. The arrangement could scarcely be better or more convenient."—*New York Herald.*

"The conspectus of the world's history is as full as the wisest terseness could put within the space."—*Philadelphia American.*

"We miss hardly anything that we should consider desirable, and we have not been able to detect a single mistake or misprint."—*New York Nation.*

"So far as we have tested the accuracy of the present work we have found it without flaw."—*Christian Union.*

"The conspicuous merits of the work are condensation and accuracy. These points alone should suffice to give the 'Historical Reference-Book' a place in every public and private library."—*Boston Beacon.*

"The method of the tabulation is admirable for ready reference."—*New York Home Journal.*

"This cyclopædia of condensed knowledge is a work that will speedily become a necessity to the general reader as well as to the student."—*Detroit Free Press.*

"For clearness, correctness, and the readiness with which the reader can find the information of which he is in search, the volume is far in advance of any work of its kind with which we are acquainted."—*Boston Saturday Evening Gazette.*

"*The geographical notes which accompany the historical incidents are a novel addition, and exceedingly helpful.* The size also commends it, making it convenient for constant reference, while the three divisions and careful elimination of minor and uninteresting incidents make it much easier to find dates and events about which accuracy is necessary. Sir William Hamilton avers that too retentive a memory tends to hinder the development of the judgment by presenting too much for decision. A work like this is thus better than memory. It is a 'mental larder' which needs no care, and whose contents are ever available."—*New York University Quarterly.*

A CHRONOLOGICAL TABLE OF UNIVERSAL HISTORY. Extending from the Earliest Times to the Year 1892. For the use of Students, Teachers, and Readers. By LOUIS HEILPRIN. 12mo. 200 pages. Cloth, $1.25.

This is one of the three sections comprised in Heilprin's "Historical Reference-Book," bound separately for convenience of those who may not require the entire volume. Specimen pages sent on request.

New York: D. APPLETON & CO., 1, 3, & 5 Bond Street.

THE ART OF MUSIC. By C. HUBERT H. PARRY, M. A. 12mo. Cloth, $4.00.

A concise and admirable exposition of the growth and development of musical art, full of the kind of information which persons desiring to cultivate a taste in music ought to have.

MENTAL DEVELOPMENT IN THE CHILD. By W. PREYER, Professor of Physiology in the University of Jena; author of "The Mind of the Child." Translated by H. W. BROWN. Vol. 24, International Education Series. 12mo. Cloth, $1.00.

The special object of this book, as announced by Dr. Preyer in his preface, is to initiate mothers into the complicated science of psychogenesis. The author desires to evoke a widespread interest in the study of the development of the infant mind, and has selected, from the extensive material he has gathered in a long period of systematic observation, that which has special reference to practical application. It is a book of much value to teachers in the kindergarten and primary schools, as well as to all parents.

SPEECHES AND ADDRESSES OF WILLIAM McKINLEY. From his Election to Congress to the Present Time. Compiled by JOSEPH P. SMITH, Librarian of the Ohio State Library. With Portraits on Steel of the Author and Others. 8vo. 650 pages. Cloth, $2.00.

These selections, sixty five in number, embrace a wide range of topics of absorbing public interest, and include twenty-five speeches devoted to the tariff question in all its aspects, and others on silver, Federal elections, pensions and the public debt, civil service reform, the Treasury surplus and the purchase of bonds, the direct tax bill, etc.

The orator whose views are thus presented is the best authority of his party on most of the matters considered. An elaborate analytical Index gives the volume an encyclopedic character, which will be especially appreciated at the present time by the student of whatever political faith.

INDEX TO THE POPULAR SCIENCE MONTHLY, Volumes I to XL, 1872–1893. Compiled by FREDERIK A. FERNALD. 8vo. Cloth, $2.50.

THE POPULAR SCIENCE MONTHLY is notably a magazine whose contents are of permanent value. Any one who is reading up a subject in natural, social, or ethical science will seldom fail to find a valuable store of information among its resources. Its twenty years form an especially important and interesting period in the spread of scientific thought and the progress of the scientific arts. As new advances have been made they have been explained by competent writers in the MONTHLY, so that the forty volumes of the magazine form a treasure-house of scientific knowledge. The new Index is a key to this treasure-house, and should be owned by all who have back volumes of the magazine.

Persons who depend on a public library for the use of the volumes will find it a great convenience to have the Index at home. Each alternate page is left blank, to give space for notes and additions.

New York: D. APPLETON & CO., 1, 3, & 5 Bond Street.